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The Diamond Jubilee of the A. V. M. A.

The seventy-fifth annual meeting of the American Veterinary Medical Association was held in New York City as scheduled, July 6-9, 1938.

The meeting, while partaking but little of the nature of a celebration of the founding of the organization, was a successful one professionally and a delight socially—the Committee on Local Arrangements, under the expert leadership of Cassius Way, the new president-elect, having functioned to the entire satisfaction of the visitors. The hotel accommodations were adequate in every respect and hardly anything else can contribute so much to the enjoyment of a meeting. The facilities of the Hotel Pennsylvania were forceful reminders of how far the headquarters hotels of other recent meetings have fallen short of fulfilling the needs of the association.

The attendance of approximately 1,300 was creditable considering the distance of the great city from the center of veterinary population in this country.

President Brumley, in his opening address, reviewed the progress of the profession during the past year and made the usual recommendation of presidents for the past score of years, that the annual dues of the association be increased. He stated that the membership of the association is now approximately 4,750, about the same as a year ago. He expressed the opinion that two or three new veterinary colleges, properly organized, adequately financed and competently staffed would be an asset to this country.

Chief Mohler's scholarly address at the opening session, on the achievements of the veterinary profession during the three-quarters of a century that has elapsed since the organization was established, was undoubtedly the high point of the program in general interest, and vividly recalled the speaker's masterly presidential address on the same theme 25 years ago on the occasion of the fiftieth anniversary of the founding of the association.

The Hon. Henry A. Wallace, Secretary of Agriculture, was elected to honorary membership in the association.

A special committee on disease nomenclature and veterinary vital statistics was authorized—a most important matter.

It was reported that 369 students were graduated from the 12 recognized veterinary colleges in North America; 224 new

OSCAR VICTOR BRUMLEY

Doctor Brumley, born in Leipic, Ohio, March 9, 1876, was graduated from Ohio State University in 1897. Continuing at that institution as a teacher of veterinary medicine, he rose through the professorial ranks to his present position of dean of the veterinary faculty. He has been prominently identified with public health work in Columbus, and in 1931 served as president of the Columbus Board of Health. Doctor Brumley has been active in A. V. M. A. affairs since joining the association in 1919, and his valuable work on various committees and on the Executive Board was recognized in his election to the presidency of the A. V. M. A. for 1937-1938. He presided at the Diamond Jubilee meeting in New York, July 6-9, 1938

members were added to the association during the year, and 43 members were lost by death. Additional loss from resignation and delinquency in the payment of dues slightly more than offset the accretion by reason of new applications.

It was decided to drop the plan for an educational exhibit at the World's Fair in New York next year, because of the unexpectedly high cost, and to return $1,180 contributed by various state veterinary associations toward defraying the expenses of such exhibit—just the old slogan "It can't be done."

The report of the treasurer was that the association possesses $68,000 in liquid assets. The association was operated at a slight loss during the year.

An ill-advised recommendation in the report of the Committee on Policy stirred up a good deal of ill-feeling that lasted throughout the meeting. The report recommended that all members of the A. V. M. A. with commercial affiliations be made associate members without the privilege of voting or holding office in the association. Of course, such a recommendation had no chance of adoption and it was later withdrawn by the policy committee; but damage had been done to the *esprit de corps* of the members.

The educational exhibits were truly educational and those responsible for them are to be commended. The commercial exhibits were unusually fine—that is the exhibits of the splendid veterinary supply houses and of medical supply houses having veterinary departments were fine. Regrettably a few off-color exhibits of medical supply houses were accepted—houses that could not get to the door of an A. M. A. meeting. It is an injustice to legitimate veterinary firms who support the association the year 'round to accept exhibits from unethical, or otherwise undesirable, medical supply houses. The local committee was not responsible for admitting these firms to our midst. Both the exhibit rooms at our annual meetings and the advertising pages of our official journal need a house-cleaning.

The Executive Board, by a vote of nine to three, reversed itself on the matter of accepting advertising from firms that supply professional products to the laity. At its meeting in December, 1937, the board had instructed the secretary-editor to reject the advertising of such firms. The instructions were not complied with. The action of the Executive Board was construed by some as an approval of the policy of supplying professional products direct to the laity.

The annual banquet was the outstanding entertainment feature of the meeting and owing to the splendid address of Dr. Morris Fishbein, editor of the Journal of the American Medical Association, no session in the entire meeting was more instructive than was the banquet.

Toastmaster R. Fred Eagle was at his best and he is always good. Some songs, written by Clif Carpenter for the occasion, and sung by a quartet hastily collected during the evening, met with uproarious acclaim.

Following the precedent of last year, the second award of the A. V. M. A.'s Twelfth International Veterinary Congress prize was made at the banquet. Dr. Geo. H. Hart of the University of California was considered by the prize committee to have made the most noteworthy contribution to the advancement of veterinary science during the past year by his studies of the vitamin A requirements of cattle, and was awarded the prize. The action of the committee met with universal approval.

A new feature of the convention was the presentation of a past-president key and a certificate to the retiring president. This being the initial presentation, past-president keys and certificates were presented to all of the 17 past-presidents present at the banquet, eight in number. The presentations were made by Toastmaster Eagle.

The speech on "Medical Science in a Changing World" by Doctor Fishbein was equal to, if not superior to, any ever heard at our banquets. Doctor Fishbein entertained, amused and instructed his audience and made them his friends for keeps. It is easy to see why the American Medical Association is a great and growing organization. It has Fishbein.

Owing to poor health, which he has been experiencing for some time, Secretary H. Preston Hoskins was given a leave of absence with pay to the end of the year. Dr. E. A. Rodier of Los Angeles was employed temporarily to manage the affairs of the association.

Cassius Way of New York was elected president-elect. The next meeting of the association will be held in Memphis, Tennessee, the dates to be set by the Executive Board at its meeting in December.

Following the precedent established at the Chicago meeting in 1933, the clinic was held at the headquarters hotel. The early mailing date of this issue precludes giving a description of it.

The part of the scientific program of greatest interest to those in attendance were the two papers on calfhood vaccination for the prevention of Bang's disease by C. M. Haring of Berkeley, California, and J. G. Hardenbergh, Plainsboro, New Jersey. The findings of Doctor Haring, in a research project carried on since 1932, were extremely favorable to vaccination. The paper by Doctor Hardenbergh described a practical application of vaccination over a shorter period. The results were highly favorable to the use of the vaccine, but not to the degree reported by Doctor Haring in experimental use of the product.

CASSIUS WAY
President-Elect of the A. V. M. A.

Doctor Way studied agronomy and animal husbandry at Connecticut Agricultural College, Storrs, Connecticut, graduating in 1899. In 1905 he received an A. B. degree from Cornell University, and in 1907 his veterinary degree from the New York State Veterinary College. From 1908 to 1919 he was employed by The Borden Company, during the last five years as chief veterinarian. He resigned this position in 1919 to enter general practice, in which he has since been engaged, together with commercial veterinary supply work. His specialty is equine practice, particularly the ailments of horses incidental to breeding and reproduction. He numbers among his clients many of the owners of the most valuable thorobred and trotting horses and of the finest horse breeding establishments in the United States. A member of the A. V. M. A. since 1908, he has served on the Executive Board for several years, and was Chairman of the Committee on Local Arrangements for the Diamond Jubilee meeting

XIII International Veterinary Congress

The official program of the XIII International Veterinary Congress is now available. It contains details of organization, lists of committees, table of meetings, reports, list of receptions, by-laws, fares, hotel prices, excursion program, map, and other information. Copies of the program may be obtained from H. Preston Hoskins, secretary of the National Committee for the United States, 221 N. La Salle St., Chicago, Ill.

Ortlepp of Onderstepoort reports the finding of a new filarid in swine slaughtered in an abattoir in Port Elizabeth, South Africa. He proposes *Suifilaria suis* as the name for this parasite.

The *Boston* (Mass.) *Globe* of May 15 contains a long illustrated news story about blood transfusions at the Angell Memorial Animal Hospital and the Clinic of the Animal Rescue League, charitable institutions maintained by the Massachusetts S. P. C. A. A significant statement in the story is: "In a kennel on the top floor of the Angell Memorial Hospital a cocker spaniel is awaiting a transfusion. *She belongs to a well-to-do family,* but developed anemia *in spite of good care.*" (Italics ours.) S. P. C. A., it may be remarked, is held out to mean "society for the prevention of cruelty to animals."

A new vaccine against equine encephalomyelitis, prepared from chick embryo tissue instead of from brain tissue of animals dying from the disease, has been developed by scientists of Duke University School of Medicine and the Lederle Laboratories at Pearl River, N. Y. They report that the new vaccine proved more than ten times as effective as the old in guinea pig trials, and has been successful in preliminary horse protection studies. They have also been able to isolate from the chick embryos a substance which seems to be the infectious agent of the disease.

In June 1898

The "Forty Years Ago Column" of the Kansas City Star Times, for June 9, 1938, contained the following:

"The annual election of the Missouri Valley Veterinary society, held at the Veterinary college here, yesterday resulted in the selection of the following officers: President, Dr. S. E. Bennett of Kansas City; first vice-president, Dr. R. C. Moore; second vice-president, Dr. J. C. Milnes; secretary and treasurer, Dr. W. A. Heck, St. Joseph."

In the same column were a number of news items concerning the Spanish-American War, then in progress.

Of the officers mentioned, only W. A. Heck, now of Knox, Indiana, is living.

Minneapolis has a rabies scare and a new dog muzzling order by the city health department. In the first five days after the order became effective, 312 dogs were taken by their owners to the Animal Rescue League to be destroyed. The Minnesota Humane Educational Society is fighting the health department rabies control measures in the courts. Its first attempt to perpetuate the disease—a restraining order against Dr. F. E. Harrington, health commissioner, and Dr. C. E. Cotton, state veterinarian—met defeat.

The eleventh anniversary of National Dog Week will be celebrated the week of September 18-24. This movement was created in 1928 by a group of nationally known dog lovers who wished to set aside one week —out of reverence and profound esteem for man's one real lover, the dog. Since that date, each passing year has proven to the minds of all dog lovers that National Dog Week is a week in which everyone should take an active part.

Robert Briggs Logan, executive secretary of the movement states: "This year's National Dog Week, with plans progressing as well as they are, will undoubtedly be celebrated in a manner long to be remembered. No stones are being left unturned to make every single person in America conscious that National Dog Week will be in progress during these dates."

Horse Practice, Then and Now

By L. A. Merillat, Chicago, Illinois

THE story of equine practice is a narrative of the evolution of veterinary medicine in modern times. In our day, it was the maker of our profession. The pre-Christian doctor of animals was delegated mainly to the care of gregarious species—the flocks and herds, the principal evidence of community wealth. The ass- and horse-drawn chariots were more military than domestic and conversely, the cattle, sheep, and swine, providers of food and clothing, were the civilians' principal resource. That is why our present knowledge of equine medicine was handed down so largely by military remount officers, of whom Apsyrtus and Vegetius were two of many examples. The very age of that branch of veterinary medicine accounts for the traditional empiricism indelibly tattooed into its makeup. As cattle and sheep medicine died out during the medieval centuries horse medicine went on defending the frontiers of a chaotic period, and as the curtain of modern times was lifted, it was the inspiration for the founding of veterinary schools and of our profession of animal medicine.

Obviously, the often-told tale of the horse passing out of use seems ill-conceived from the outlook of the present time. There is no more in the present perspective to justify that prophecy than there was when man first began to aid his arms and legs by conscripting the fauna around him. The horse has power and speed that man still needs to carry on. True, inventions have come along from time to time to dispossess him of certain important vocations, too well known to repeat here. But none of these were ever much more than a temporary threat. On the whole, inventions have always increased the need of a larger equine population. Just now the tocsin is the internal combustion engine. But is it more of a tocsin than the coming of the steam engine, inasmuch as the tremendous wealth it has created is already reflected in the present day increase in the number of horses of sport and pleasure? Perhaps when fuel becomes more expensive, taxes keep mounting, and computing the cost of production overtakes the business of farming as it should have done long ago, it is not irrational to expect that the former ratio of work horses to man will be reëstablished.

One must, however, admit that the changes in vehicular transportation did revolutionize the practice of veterinary medicine all over the world. In some respects, the motor age has been as brutal to the veterinary profession as the winged bombers of modern warfare are cruel to unprotected children. In other respects, the change from forage to gasoline has been as much of a benefaction to horses as to mankind. Horses have always been worked beyond their normal endurance. The motor-drawn vehicle has come to their rescue. As for man, not to mention the satisfaction of independent transportation, the power and the speed furnished by motors have always been outstanding needs in human progress.

ON the one hand, the replacement of horses by motor power on street, highway, and farm, tore a great gap in the veterinary structure; on the other, it turned the study of animal diseases into erstwhile neglected ground. While the change was said to have been sudden, as a matter of fact it came on slowly between, let us say, 1898, when the first electric taxis came upon the streets of large cities, and 1920, when the last coupé had passed from the urban landscape, the cartage horse had practically vanished, and the tractor was plowing a considerable percentage of the land. A change coming on gradually during 22 years or so can hardly be called rapid in this day of quick-shifting enterprises. The change was not as rapid as our veterinary profession was slow in readjusting itself to what was filing across the screen before its very eyes. During these two

decennia (1900-1920), a profession with more foresight than ours has ever shown—a profession better organized and directed—might have been training its personnel for the coming of a day when much of its *raison d'être* was being abolished. One has but to unroll the scroll of the educational system to prove that the veterinary colleges were not revising their curricula to conform to coming events. It is no credit to the veterinary profession that bovine, porcine, ovine and avian medicine were not developed *au fur et á mesure* with the vanishing of the veterinarian's principal source of revenue, to look only at the commercial aspect of the picture.

SO, when the smoke of the World War had cleared away, there was chaos in the ranks. The agricultural and industrial depression of the '20s, brought about by tremendous surpluses (including horses and mules) thrown suddenly into the channels of commerce, came at a time when the ex-veterinary officers, comprising about 20% of the total personnel of the profession, were readjusting themselves to their former civilian status. Inevitably the whole veterinary setup became disorganized, especially in the larger cities. It is needless to add that during the absence of the ex-veterinary officers for two years or so, the horse and mule had not only ceased to be the background of veterinary practice but, especially in the Middle West, the extension services, expanded for military purposes, were found to be occupying considerable territory left behind by these practitioners who had gone to war. No one knew just where to turn. The element of uncertainty was discouraging, but the principal obstacle to readjustment was lack of training on diseases of the food-producing species. What has happened since then is well-known, recent history.

Although this is supposed to be an essay on horse practice, it seems apropos to mention this post-war catastrophe because it marks the end of a glorious veterinary era—an era that began, roughly speaking, with the founding of veterinary schools (1761) and ended soon after the World War (1920). In this country, one should set the birth of the "glorious era" at the founding of our own veterinary schools (1875). The demise (1920) came at the same time all over the world. Veterinary medicine went from horse to dog, cattle, swine, etc.

BUT why call it glorious? Well, for one thing, horse medicine was the maker of the veterinary profession, the foundation upon which veterinary science was erected, the builder of our associations, and the framer of the laws under which we labor. It furnished the first teachers, the first livestock sanitarians, the first meat inspectors, the first research men in our field. If the veterinary service protects the people against poverty, famine and pestilence; if it is instrumental in maintaining national integrity and security by conserving property and by insuring an amplitude of food as we are wont to claim, then all this should be credited to the old horse doctors. It was not the fine canine specialists, the wise experts in bovine medicine, the swine, poultry, and sheep pathologists, nor the savants of the laboratories who laid down the groundwork for what we are and for what we hope to be. And, if prophecies are in order, the equine branch will continue to play a significant rôle in the evolutionary process of the future, because the horse and the mule will probably continue to be the most valuable domestic animals in the fields of sport, pleasure and farming.

But horse medicine was glorious from another angle. Its practitioners were independent cusses and indomitable fighters of quackery. They fought for a high standard of ethics for themselves and against an array of self-made empirics of lower average intelligence who defended themselves, with no blows barred, against the coming of college men. When one tries to tell the tale of the "good old days", the difference between obedience of professional ethics in 1888 and in 1938 presses itself upon the mind. If one who entered the profession in 1888 and the educational system, such as it was, in 1892, and who watched

the development of organized veterinary medicine from that time on, has no liking for quackery and says so, it is because he was taught that way. As the twig is bent, so grows the tree. The veterinarian engaged in practice who grew up under the inspiring conduct and teachings of the Laws, Liautards, Bells, Berns, Stewarts, McKillips, Bakers, Stalkers, Hoskins, Pearsons, the Smiths and M'Eachrans, could no more remain content *vis à vis* with the threats of unethical medicine than the condemned intelligentsia of the communistic régime could yield to their fate without protest. It was a case of intelligence and education versus ignorance, with the fate of a new profession at stake, a profession needed by a vast livestock industry harrassed by disease in every corner of the country, a profession striving to advance unaided by public support or dignified precedent. The horse doctor's only advantage was the unmolested privilege to cry "quack" loud and often without the risk of being kicked out of his job or criticized by his colleagues for daring to do so. Yes, if independence of thought and action has charm, those *were* "good old days." Nowadays, the practitioner is enmeshed in an *entourage* that keeps his professional soul pretty silent.

One wonders what has happened to the veterinary profession that it has become unpopular to call a quack, a quack. I notice that the staid *Journal of the American Medical Association,* spokesman of the medical profession, hasn't forgotten the definition of that word nor the importance of curbing the thing it represents in the march of medicine. The veterinarian who got his college training in the 19th century wonders whether the practice of his art, with all it means to a civilization growing with leaps and bounds, should not still be governed by the conventions of professional life instead of cringing before the well-known power of quacks and quackery. These are questions I leave others to ponder.

Conditions have changed and obviously the strategy of attack on quackery in medicine must change also. But the fact remains that neither our profession nor a single member of it can compromise with quackery in any form without lowering the usefulness of veterinary science and sacrificing the honor of its personnel. These were the governing issues of the vanguard who practiced equine medicine 50 years ago, and these are the issues that should preoccupy the mind of all veterinarians at this hour. Such things can't change in spirit without soiling the soul of the man himself.

HORSE medicine made great progress during the last two decades of the 19th century. The progress, too, was glorious. It followed closely the historic development in bacteriology and the revolution in the therapeutics the new science brought in. And as mentioned above, it was not too busy to organize, procure laws and man the new projects in the fields of education, sanitary science, research, and the clinic. It left a foundation to build upon. If the house you now build becomes unfit for respectable occupants, or tumbles down, perhaps the cause will be the unfought quackery you have permitted to be used in the construction work. The vanguard rejected everything that seemed quackish and they were never outvoted in any of their own councils. The belief that quackery was a bad thing to tolerate was unanimous. It was not a *faux pas* to protest against the use by untrained men of even the simple remedies of that day. Such a thing, for example, as teaching farmers how to vaccinate their own hogs with a deadly virus would have been unthinkable and openly condemned without apology to anyone.

The short college course of the time may be pointed out by the five-year man of this hour as ridiculously insufficient. But was it? The length of legitimate college courses corresponds to the scope of the ken they feign to cover. I often wonder just what our professors would have taught had they kept us in college any longer. As a matter of fact, the 19th century graduates went into practice overflowing with the knowledge of *their* day just as the graduates of

this year are doing. Only colleges below par turn out delinquents.

AN outstanding fault of the early practitioners was their lack of fraternal coöperation. In their fight on quacks, they fought one another, and like the belligerents of this day, degraded their vocation before the watching audience. It was not until the associations began to strike their stride that the majority began to realize the wisdom of maintaining the prestige of their art through fraternization outwardly expressed before critical clienteles. Reforms in this respect began in the 1880's and 1890's and, while not universally practiced even unto this day, it was the doctors of horses who implanted the seeds of neighborly behavior toward one another. Today the practitioners play the part of the good neighbor with but rare exceptions, better perhaps than the groups of which the profession was then composed, although there are some who remain to be inoculated with the germ of close coöperation for the general good of the whole.

Paraphrasing, when one looks beyond the turn of the century one finds the practitioners of equine medicine standing out from the crowd, dominating the science and art of veterinary medicine, studiously seeking new ken, and courageously defending a pattern of professional ethics that the present personnel would do well to adopt unmarred by compromise with quackery in low and high places, by the display of glamorous advertisements in telephone directories or by similar indiscreet practices deplored by the equine doctors of the nineteenth century, who strove to found a new profession upon the doctrines of sound medicine and uplifting behavior. If the present generation has forgotten the fine character and noble ambitions of the early educators and leading clinicians, it certainly has had a strange lapse of memory, or else lacks the habit of building from precept and example.

IN stating the case of equine medicine one must not forget that truly scientific medical research is hardly more than 25 years old; certainly not over 50 years. So far as equine medicine is concerned, research never struck a worthwhile stride at all. We have carried on content with the customs of the legendary past, handed down from generation to generation, which the fine research of the present has failed to abolish. Old customs are, of course, hard to break down; but the main failing in horse medicine is that it has been neglected since medical research has begun to clarify some of the pathologic mysteries of the past. Being preoccupied with other animals, research has not bothered with a species of domestic animals that seemed to be passing from the social arena. To understand what is meant by such a pronouncement one has but to watch the archaic practices in the higher brackets of horsedom: firing the yearling thoroughbred to make him "stand up"; the use of so many "famous cures for bad legs" at $5.00 a bottle; the belief that timothy hay, oats and water comprise a sufficient ration; and the endless file of similar customs which the practitioner cannot discard without the risk of being drummed out of the stable as an unqualified ass.

Yet with all its faults, the contributions of equine medicine to the general fund of veterinary knowledge in modern times are not only the gifts upon which veterinary science was built but the ones that created whatever altruism is left in the practice of animal medicine. To be polite, one must just doff his hat to equine medicine, the maker of a profession and of this civilization.

GEE, fellows! Nowadays you're enmeshed in a strange system of veterinary medicine. You have to whisper complaints that are eating out your hide and some of the things you ought to have on your dinner table. You daren't say quack without risk of losing your job. Not we, old top! We detested quacks and quackery because they were bad examples, because they took away some of our bread and butter, and because we thought of them as harmful to our country. Sooner or later, you, too, will copy this pattern of professional behavior.

Mycotic Pneumonia (Aspergillosis) in a Young Calf

By G. T. CREECH, Washington, D. C.,
Pathological Division, Bureau of Animal Industry, U. S. Department of Agriculture

There are many mold fungi, hyphomycetes, prevalent in nature, only a comparatively small number of which are of a true parasitic nature, capable of attacking the living animal tissues and causing definite pathological changes. Of the pathogenic forms of mold, the *Aspergillus* is one of the more common, particularly the *Aspergillus fumigatus*, as the cause of mycotic pneumonia.

Pneumonomycosis is not uncommon in birds, both wild and domestic, but is much less frequently observed in mammals, and the limited number of cases that have been reported in cattle would indicate that this type of pneumonia is seldom encountered in the bovine species.

In mycotic infection of the lung tissue the organism gains entrance by inhalation. After reaching the alveoli of the lungs the mold spores develop into threads, or mycelia, multiplying rapidly. The subsequent tissue reaction, resulting from the invading

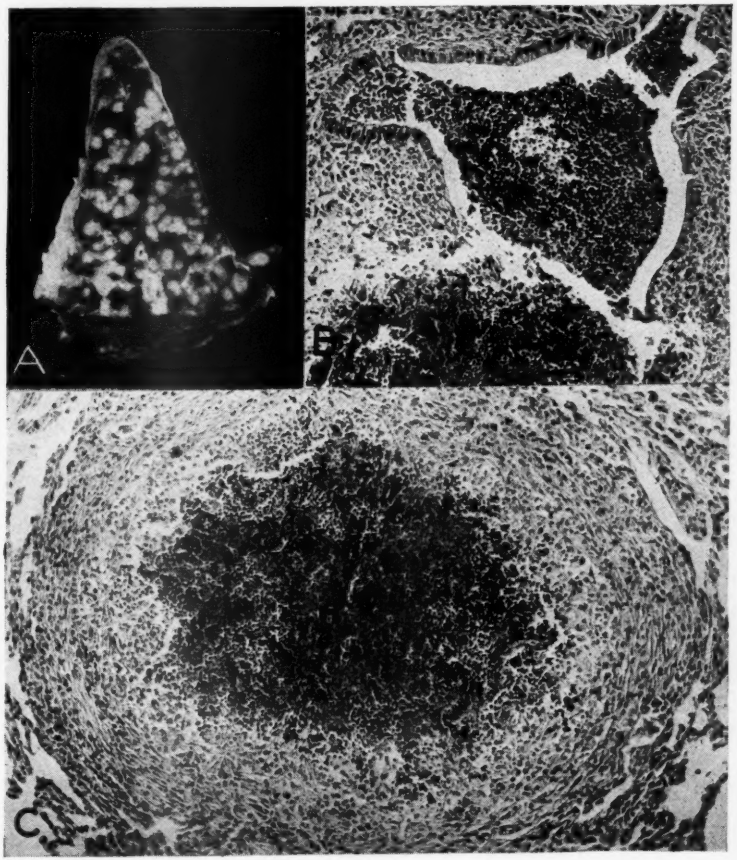

FIGURE 1

A. Photograph of portion of calf lung showing nodular lesions; 4/5 natural size.

B. Photomicrograph of section of the lung showing rupture of wall of bronchiole adjacent to one of the purulent foci. X 100.

C. Photomicrograph of lung section showing one of the larger, encapsulated nodules with necrotic center. X 100.

organisms, soon develops into definite and well-marked pneumonic changes.

The case of mycotic pneumonia in a calf, described in this report, was encountered at an officially inspected slaughtering establishment by Dr. F. J. Flynn, Veterinary Inspector, on the force of Dr. C. L. Hall, Inspector in Charge, at Newark, N. J. The affected animal was described as an 8-day-old male calf which was condemned for immaturity.

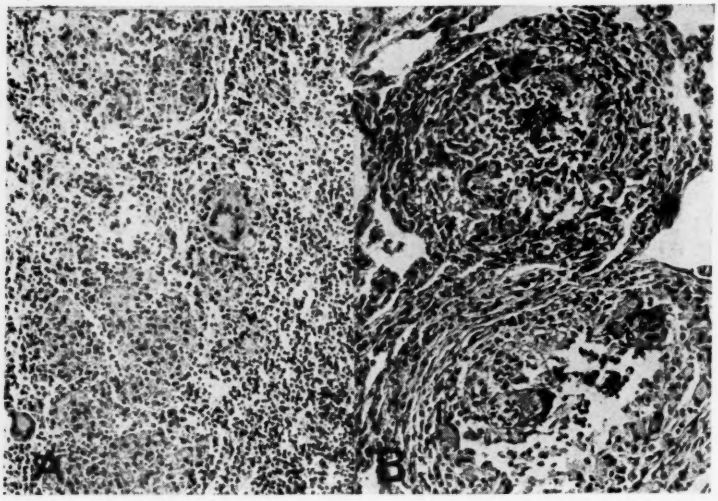

FIGURE 2

A. Photomicrograph of section of lung of calf showing an area in which the lesions were suggestive of tuberculosis. X 120.

B. Photomicrograph of lung section showing giant cells within the nodules. X 132.

The gross lesions consisted of numerous small, grayish or slightly yellowish nodules varying from one to three millimeters in diameter. While only a small portion of the lung tissue was received at the Pathological Division for examination and study it was stated in the autopsy report that the nodular lesions were rather uniformly distributed throughout both lungs. The inspector's record of the case also indicated that the lesions were confined strictly to the pulmonary tissue with no involvement of the associated lymph glands. In their general gross appearance the lesions were suggestive of tuberculosis. (Fig. 1, A.)

Both bacteriological and histopathological studies were made of the lung lesions. A microscopical examination of smear preparations, made from the nodular lesions, and stained for acid fat organisms, failed to show the presence of tubercle bacilli. The affected lung tissue was cultured on broth and on serum agar media. After several days' incubation both types of media showed pure cultures of a mold which showed characteristics suggestive of *Aspergillus.* On microscopical examination of sections made from the lung tissue mold mycelia could also be demonstrated in the necrotic centers of the larger nodules. The findings thus pointing definitely to the mold as the cause of the lung lesions, cultures of the isolated organism were submitted to Miss Vera K. Charles, Associate Mycologist of the Bureau of Plant Industry, for definite identification. Miss Charles reported the mold culture as belonging definitely to the *Aspergillus fumigatus* group near the *A. bronchialis,* Blum, a species which is considered a form of *Aspergillus fumigatus.*

The histopathological findings in this case were quite interesting. In some areas the lesions were more or less diffuse, with the formation of catarrhal foci here and there in the pulmonary parenchyma, and plugging of the lumen of the bronchioles. Several instances were noted in which ruptures of the bronchial walls had occurred adjacent to the purulent foci. (Fig. 1, B.) For the most part, however, the lesions consisted of numerous encapsulated nodules, the larger of which usually showed degenerated and necrotic centers (Fig. 1, C.) Several of the

older necrotic foci showed limited calcification.

Pathologists have noted the similarity of mycotic lesions of the lungs to those of tuberculosis, and this was found to be one of the interesting features of this case. In those areas showing the diffuse lesions, the cellular elements present, including numerous well-formed giant cells, gave an appearance closely simulating tuberculosis (Fig. 2, A.) Numbers of giant cells were also seen within the nodules (Fig. 2, B), and in the smaller foci scattered through the lung parenchyma outside the nodules.

As previously indicated the mycelia of the causative mold could be seen in the necrotic centers (Fig. 3, A). Mycologists seem to be of the opinion that pathogenic mold fungi of this type probably do not show fruiting in the invaded tissues outside of the air sacs or bronchioles. In several of the lung sections from this case a number of small bodies were noted, some of which appeared to be definitely outside the alveoli and bronchioles (Fig. 3, B), while others were seen within the very large giant cells. The significance of these bodies was not determined.

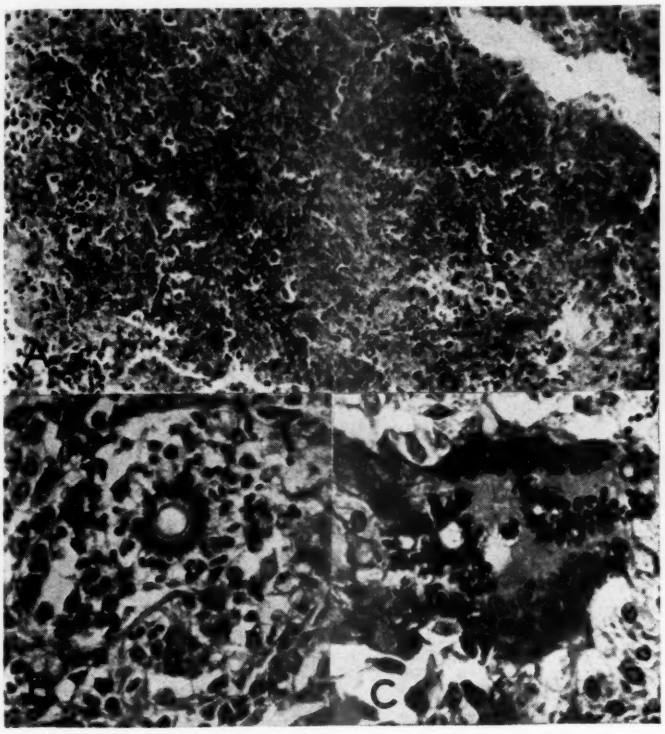

FIGURE 3

A. Photomicrograph of section of calf lung showing the mold mycelia in the necrotic centers. X 240.

B. Photomicrograph showing one of the small bodies suggestive of fruit head of fungus. X 400.

C. Somewhat similar bodies which were seen embedded in one of the very large giant cells present in the lung lesions. X 400.

Consideration of the advanced and chronic character of the lesions found in this case is particularly interesting, in view of the age of the animal. Granting that infection took place on the date of birth the development of such lesions during the brief span of life of this calf would be considered very unusual, to say the least. Therefore, excluding the rather remote possibility of infection during fetal life, the lesions in this case are of special interest as illustrating the rapidity with which such advanced and progressive tissue changes may occur within a fairly definite, but surprisingly brief, period of time.

Importance of a Blood Picture to a Veterinarian

By WARREN L. SKINNER,
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A ROUTINE examination of the blood of all patients presented to the practitioner would be impractical, both because many conditions can be properly diagnosed and treated without such a routine, and because too much time would be required for it. Many disease processes, however, are manifest directly in the blood, and many are carried over the body by means of the blood. Since the blood bears such an important relation to disease, it is obvious that its examination gives valuable evidence in regard to the etiology of disease processes. In most cases, however, the blood findings must be considered in conjunction with the history, physical examination, and possibly other laboratory methods; only a few diseases, such as leucemia and pernicious anemia, may be diagnosed solely on the blood examination.

Malkmus, in his "Clinical Diagnosis" states: "The exâmination of the blood is necessary in case of suspicion of its abnormality as well as of the blood forming organs, further for the determination of infectious diseases or chronic nutritive disturbances in the absence of a definite symptom complex." Not only does the blood examination add additional support to a diagnosis, but it also gives a more complete knowledge of those conditions of the blood which are associated with but do not necessarily characterize pathological processes. Investigation of the morphology of the blood is likewise valuable as a means by which a prognosis may be made. The blood is in intimate relation with practically all the other tissues of the body, bringing substances to them and carrying away other substances. Thus the blood is affected by all the tissues. In its desire to enjoy good health the living body strives by every means to maintain the blood in a normal state with respect to its mass, its density, and its morphology. When a malady establishes itself in the living organism the various features of pathological blood arise; practically no disease exists which leaves the blood unaffected.

"The normal blood picture is made up of circulating, generally matured (although not of the same age), highly differentiated cells, mixed in rather constant proportion."[1] The pathological change in the blood picture occurs when physiological degeneration or regeneration of the blood cells is increased and their limits displaced and interfered with. Consequently, the blood picture is a result or a symptom of this regenerative and degenerative coöperation. It should be clearly understood that the blood picture is only in its central factors a symptom of the condition of the hematopoietic organs, without being constantly its true reflection. The blood changes may have no connection with the disease in question, or they may be obscured and are, therefore, subject to the same limitations as the clinical symptoms. So, in arriving at a diagnosis, it would seem desirable to observe the blood picture together with the complete clinical findings.

	Horse	Dog	Cattle	Sheep
Red Count	7,300,000	7,340,000	7,600,000	11,950,000
Hemoglobin concentration (in gms. per 100cc blood)	12.6	14.1	13.2	12.2
White count	9,000	13,000	5,970	6,210
Differential Count: Percent				
Neutrophils	58.4	68.5	33.0	23.4
Eosinophils	4.4	7.1	4.5	0.28
Basophils	0.5	0.25	0.86	0.36
Lymphocytes	35.5	20.69	58.4	75.9
Monocytes	1.53	3.61	3.4	0.26

[1] Schilling: The Blood Picture.

The chart of Normal Blood Standards on the opposite page was taken from an article by A. H. Craige in the *University of Pennsylvania Bulletin,* Vol. xxxiv, April 16, 1934.

The different tests which may be used in examining a blood sample are comparatively simple in the hands of the practitioner after a little practice.

The Red Blood Count

The total quantity of blood varies under different conditions; it is generally accepted that it may be increased by proper hygienic conditions and decreased in unhygienic and certain pathological conditions. Since the method of measuring the quantity of blood is too complicated for ordinary clinical use, the clinician is forced to rely on the findings of an examination of a small quantity.

Polycythemia, or an increase in the number of red corpuscles per cmm., does not, in many cases, indicate an actual increase in the total number in the body, as any condition producing a concentration of the blood by withdrawing fluid from it (anhydremia) will produce polycythemia. For example, such a change is produced by watery diarrhea from the administration of purgatives and in infectious diseases, by profuse sweating, by withholding water, by continued vomiting and by rapid exudation. If such conditions are severe enough to drain the blood of much of its required fluid, one of the expected clinical findings would be dehydration in varying degrees in accordance with the severity of the condition. The red blood count is of little importance in such a condition, except in supporting a diagnosis made from other evidence, but morphological or pathological conditions of importance may be found in the remaining tests.

Most morphological changes of the red blood corpuscles are met with in conditions of anemia, and consequently may be looked upon as evidence of the presence of an anemic syndrome. Anemia, meaning lack of blood, occurs in a variety of conditions, the more important of which are: hemorrhage, diminished nutrition, marked exudation, diminished activity of the blood-forming organs, and increased destruction of red corpuscles. In an attempt to overcome such situations the body provides a regenerative action on the part of the erythroblastic apparatus of the bone marrow, forming new erythrocytes continuously. It is not necessary to rush to the laboratory with a blood sample every time an animal is thought to be anemic; it is shown clinically by pale mucous membranes. A blood examination may, however, help, and should be undertaken in those baffling and prolonged cases in which therapeutic measures have been used with but very little success. A dimunition in the amount of hemoglobin in grams per 100cc, as shown by a hemoglobinometer, is the cardinal sign of all anemic conditions, in the broadest sense of the term. Whatever the findings may be, another link is added to the chain of symptoms which go to make up a correct diagnosis. To those men, who, for one reason or another, do not wish to bother with a detailed red blood count, the Talquist hemoglobinometer is recommended. It is in the form of a book made up of special blotting paper, with a standardized color chart in the back. The test requires less than a minute to make and the results check with other more complicated methods.

The White Blood Count

The object of this portion of the blood examination is to determine if there is a deviation in the number of leucocytes per cmm. from the normal and if so, how much. For example, lymphocytosis, from a clinical viewpoint, is of value chiefly in the diagnosis of lymphatic leucemia. Enlargement of the lymphatic glands, associated with a marked absolute increase in the number of lymphocytes, forms a pathognomic picture of the disease.

Leucocytosis may be described as an increase above the normal standard in the number of leucocytes in the circulating blood and is often the result of an irritative, toxic interference with some function. Usually a slight to marked leucocytosis is expected in the case of inflammatory processes. However, the increase in leucocytes does not run parallel with the fever, as there may be a marked leucocytosis with little rise of temperature or *vice versa*.

It is of interest to note that a distinct leucocytosis is found following traumatism or hemorrhage from other causes. The grade of leucocytosis varies directly with the amount of blood lost. Also, in general, the transfusion of salt solution seems to increase the amount of leucocytosis.

That the leucocytes of the blood are actual or potential phagocytes is the fundamental fact in Metchnikoff's theory of immunity, and by Leishman's method a quantitative estimate of this phagocytic power may be obtained. Phagocytosis occurs in both physiological and pathological conditions. All forms of the white blood cells, the lymphocytes proper excepted, possess in a variable degree the power of ingesting other cells, finely-divided carbon, certain chemical substances, and bacteria. Hence, the living animal remains in health not because of the absence of attack, for this is constant and persistent, but because an efficient means of defense normally exists. Usually, when bacteria make their entrance into an organism an intense cellular activity results which seems to be an attempt on the part of the leucocytes to destroy the invading principle and to counteract its noxious influences. Thus, a leucocytosis would normally be expected in the case of parasitism, inflammatory and toxic conditions, malignant diseases, and infection.

The Blood Smear

In the various diseases the changes in the blood, when changes are found, depend on the character of the pathological processes present and also on the nature of the exciting cause. When there is suspicion of some protozoan or parasitic disease of the circulatory system, or when it is desirable to obtain the percentage of the different forms of leucocytes the blood smear is invaluable. For instance, filariasis in the dog is easily diagnosed by making a blood smear and finding the parasite, *Dirofilaria immitis,* upon microscopical examination. There are many other diseases, such as Texas fever or other conditions caused by different forms of the *Babesia* organism, anthrax, dourine, anaplasmosis, surra, nagana, mal de caderas and Gambian horse sickness which can be completely or partially diagnosed by the use of a blood smear.

A LIVER MALADY

This photograph, from Dr. S. E. Hershey, Charleston, W. Va., shows the liver of an 8-year-old, male wire haired fox terrier. The animal was in good health until two months before death, when it developed symptoms indicative of some liver ailment, for which it was subsequently treated. It responded to treatment for three weeks, then suffered a relapse and died. On post-mortem examination, the enlarged liver was found in the condition shown in the photograph. There were no other apparent lesions. Doctor Hershey asks for suggestions for diagnosis of the condition.

Practical Hints on Removal of Stains

The veterinary practitioner can hardly avoid contaminating his hands or clothing with stains and odors, even though he exercises all practical precautions. From time to time isolated references to the removal of stains have appeared in the periodical literature . The author has found no text or other compilation of such information particularly applying to the veterinarian. It is believed therefore that a concise résumé of some of the methods of removing stains will be welcome to the practitioner.

Chemical Stains

Argyrol will yield to 10% solution of potassium iodide followed by 10% sodium hypochlorite solution.

Chromates can be removed by using 10% sodium hyposulphite solution followed by dipping in 1% sulphuric acid and immediately rinsing in water.

Flavines require the application of bichloride of mercury, 1/500, either as soap or solution.

Iodine can be removed from the hands by bathing in saturated sodium thiosulphate. If on cloth, use chlorox or boil in 1% aqua ammoniæ for five minutes.

Malgreen responds to the commercial stain remover sold by the veterinary supply houses for this purpose, or tincture of green soap may be tried.

Mercurochrome requires the use of glacial acetic acid followed by ether and thorough rinsing.

Nitric acid can be removed by using 2% potassium permanganate solution until it is stained brown, then removing this stain with 5% hydrochloric acid.

Picric acid is easily removed with 20% sodium sulphate solution followed by soap and water.

Potassium permanganate will yield to 5% hydrochloric acid, or saturated solution of oxalic acid made up freshly from crystals, followed by thorough washing.

Pyoktanin blue (methyl-violet) can be removed from cloth by overnight soaking in tincture of green soap, alcohol, or chloroform. On hands any of these three should be used repeatedly.

Miscellaneous Stains

For *blood* use 5% solution of trisodium phosphate, and rinse well.

Egg yolk should be softened with glycerine and washed in tincture of green soap.

For *ink*, try first a 2.5% sodium perborate solution. If this fails, use aqua ammoniæ or a 5% solution of ammonium hydroxide.

Nicotine stains require the use of 2% potassium permanganate solution followed by bathing in a mixture made of sodium sulphite 25 parts, water 100 parts, and hydrochloric acid 2 parts. Rinse well.

Oils and fats can usually be removed with ether. If not use a mixture of glycol oleate 1 part, hexalin 2 parts, and carbon tetrachloride 1 part.

For *rust on instruments*, dip the instruments repeatedly in mixture of one part kerosene and 200 parts carbon tetrachloride or benzene, allow to dry in air, and rub with a soft towel. Treat needles similarly.

To remove *vomitus*, soak in 10% ammonium chloride solution and rinse well.

Odors

Alveolar periostitis odor can be diminished by staining the hands and arms a dark brown with 3% potassium permanganate, and then removing this stain by the method given above. Follow with a little alcohol rubbed on the skin.

Iodoform odor will yield to repeated washings in 1% aqueous solution of tannic acid.

Phenol odor is most persistent, and little or nothing can be done to rid one of it. It can be diminished somewhat by the liberal use of alcohol rubbed on, and then partially disguised by rubbing on volatile oils such as wintergreen, clove, or peppermint.

Skunk odor will usually yield to repeated use of 5% aqua ammoniæ solution.

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Poultry Practice

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The control of poultry diseases depends largely upon the practicing veterinarian. If he is to function properly in this capacity, he must be well-grounded in the fundamentals of poultry hygiene, sanitation, physiology, pathology, and bacteriology, as well as experienced in poultry matters. Like all worthwhile things, such training requires time and close study, but it is within the reach of all who desire it and are willing to comply with the necessary requirements. With such a foundation the proper procedure toward controlling a disease will often suggest itself. The time has come when we must depend upon such training instead of upon a few minutes spent among the pages of a formula book. Until such a program is adopted, the control of poultry diseases will remain a matter of speculation.

A great need of the veterinary profession today is that the practitioner learn something about poultry husbandry. In no phase of his activities is the practitioner called upon more frequently for advice than in that regarding the care, feeding, and raising of poultry, and in many cases he is responsible for no inconsiderable financial gain or loss. In every community one finds one or more poorly-informed individuals willing to furnish treatments curing every malady to which poultry is subject. The damage done by these treatments is closely seconded by nostrums sold under misleading advertisements claiming phenomenal results.

Problems of Management

In a discussion of poultry practice, the first problems that come to mind are those of management, because proper management forms the foundation upon which disease prevention and control are based. The first thing to be done in any disease outbreak is to see if any significant errors in management exist and if so, to give proper advice for their correction. Some of the most significant errors that bear directly or indirectly upon health of poultry are:

1. Improper Breeding: (a) Breeding from weak birds. (b) Using birds that have been force-fed for production or otherwise kept under high pressure conditions. (c) Stock closely inbred for some special reason.

2. Improper Housing: (a) Poor ventilation. (b) Insufficient room. (c) Insufficient sunlight. (d) Improper temperature. (e) Dampness. (f) Insanitary conditions. (g) Improper drainage.

3. Improper Feeding: (a) Unbalanced diet. (The most significant errors are too much or too little animal protein concentrates, improper mineral supply, and insufficient direct sunlight or cod liver oil substitutes.) (b) Overfeeding or underfeeding. (c) Improper green food supply. (d) Too little grain.

4. Failure to rotate runs and to maintain satisfactory sanitary surroundings.

5. Chilling, overheating and crowding baby and growing chicks.

6. Chicks kept too long in battery brooders or under similar conditions, causing dietetic and respiratory diseases.

7. Allowing dead carcasses to remain in the yards and houses.

General Control Measures

1. Regulate any significant errors in management.

2. Isolate or kill and burn all sick birds as soon as observed. This measure may not always be practical, because of the nature of the disease and the extent of flock involvement, but it is an excellent general principle to follow. In some cases the removal of all well birds to new, clean quarters is advisable. The drawbacks to the latter procedure are expense of fitting new quarters and liability of infecting clean ground.

3. Thoroughly clean and disinfect houses. Remove litter and droppings daily and place where the poultry do not have access to them.

4. Whenever practical, divide flock into small groups.

5. Clean and disinfect by boiling all drinking vessels and place them where a minimum of filth and débris can get in them.

6. In acute infectious diseases a light diet with special reference to curtailing animal protein concentrates is advisable. Buttermilk, when obtainable, is always an excellent food and can be given in large quantities. Fresh green food in large quantities is valuable in respiratory conditions.

7. Satisfactory housing conditions are especially important during an outbreak of a respiratory disease. The house should be warm, but not too hot, dry, well-ventilated, free from drafts, and arranged to admit a maximum amount of direct sunlight to penetrate to all parts of the building as far as possible.

8. Medicinal and biological agents should be used at the discretion of the attending veterinarian to suit the particular condition. Although their benefits are sometimes more imaginary than real, the psychological effect alone may justify their use, by insuring the institution of more valuable hygienic and sanitary measures by the client. Antiseptics and astringents may be used, but should be regarded as accessory to hygiene and sanitary measures.

Only the principal diseases which are most frequently encountered by the practicing veterinarian will be discussed in this article; even so, it will not be possible to go into detail about the pathological or bacteriological aspects of all these diseases, but merely to give the differential diagnostic features. The diseases discussed will be referred to in connection with their probable importance in most sections of the midwest.

Pullorum Disease

The term bacillary white diarrhea is commonly used for a disease more accurately termed pullorum disease. There are four important infectious diseases of baby chicks of which a whitish diarrhea is a common symptom: pullorum disease, aspergillosis, cholera and coccidiosis. Many other conditions, such as faulty regulation of brooder heat, feeding, chilling, overheating, may also cause a white diarrhea.

Pullorum disease, present to some extent in a large percentage of farm flocks in this section, rarely kills adult birds. Losses occur in chicks from the time of hatching until they are approximately three weeks of age.

Symptoms.—Generally there is first observed a disposition to huddle together under the hover or under the hen more than chicks should. Affected chicks appear listless, stupid, sleepy and indifferent to what is going on about them. They stand in one position or sit still, making but few efforts to pick up feed; feathers are ruffled; wings droop; and in many cases a characteristic diarrhea occurs. The droppings may be white and creamy, or may be mixed with a brownish material and gas. Often the droppings adhere to the feathers, completely covering the anal opening and causing a condition known as "pasting up behind", which causes the chicks to emit a shrill cry at attempts to void droppings. Respiration may be difficult and the bird gradually becomes weaker. Losses in a brood may vary from 10 to 80%, and frequently it is impossible to raise any of them.

Symptoms may be observed an hour before death, or a few days before death. Most of the losses occur in chicks 2 to 12 days old, usually beginning on the second day, reaching the peak on the seventh and eighth days, and gradually decreasing thereafter.

Lesions.—Lesions are diagnostic in about 75% of all cases. Lesions of diagnostic value are small areas of leucocytic infiltration, acute hepatitis and enteritis. In the various organs leucocytic infiltrations appear as small white or gray colored nodules, varying in size from a pin point to that of a pea. These nodules appear in the pancreas, heart muscle, gizzard muscle, and the intestinal wall, liver and lungs. When these nodules are present in the lungs they are frequently surrounded by a zone of inflammation. Small nodules are seen in the liver and spleen as small white specks just under the capsule. In involuntary muscles these nodules are usually larger than in other or-

gans, are well circumscribed, and may take the general direction of the muscle fibers in which they lie.

There is also a severe hepatitis characterized by enlargement, increased friability and a mottling of different shades of yellow or brown, although the organ may be a solid color. Large unabsorbed egg yolk is an indication of, but not a proof of, pullorum disease. Pullorum disease is the only disease of young chicks under six weeks of age in which enlargement of the spleen occurs. The symptoms are identical with those of fowl typhoid except that pullorum disease affects young chicks, and lung lesions are present, while fowl typhoid affects older birds, and the lungs are not involved.

Pullorum Infection of Adult Fowls

Chicks which recover from this disease frequently retain the causative organisms in their bodies, thus becoming carriers. Usually no external symptoms are noticed, and the disease is revealed only by application of the agglutination test or by post-mortem examination.

Lesions.—The ovary usually presents a characteristic appearance. The wholly or partially developed yolks are angular in outline, shrunken, and discolored to a darkish brown or greenish color. At times the yolk contains dark fluid. These lesions are usually diagnostic of the disease in adult birds.

There is no treatment of great value for this disease in baby chicks; methods for combating the disease should be centered on applying the agglutination test to all adult birds to be used as breeders.

There are two practical tests for use by the practicing veterinarian — the whole blood test and the serum rapid test. The latter is somewhat more accurate than the former, comparing very favorably with the tube test. After flock is tested, all reactors should be removed immediately and the premises disinfected.

Coccidiosis

This is an infectious disease caused by protozoan parasites called coccidia. It occurs principally in birds between the ages of 4 and 12 weeks; the younger the chicken the more severe the disease. The chief symptoms of coccidiosis are unthriftiness, ruffling of feathers, lack of appetite, diarrhea which in some cases may be bloody, weakness, and anemia. Lesions of coccidiosis vary, depending upon the particular species of coccidia involved in the infection. The most common form is due to a parasite, *Eimeria tenella,* which causes the characteristic bloody droppings. Symptoms in this condition are similar to those already described. However, the lesions occur primarily in the ceca, which upon opening appear to be filled with a bloody exudate consisting of desquamated epithelial cells, fecal material, blood and parasites.

Another type of coccidiosis is the one due to the *Eimeria mitis.* In infections with this particular type, the lesions are confined entirely to the upper portion of the small intestine. These appear as small, white areas about the size of a pin point. In extreme cases the intestinal wall becomes thickened, and the pin point areas may coalesce into larger areas reaching the size of a dime. When these areas are examined under the microscope, they are found to be clumps or clusters of coccidia. Hemorrhage is very rarely present in the intestine in this type of infection. The chief symptom shown by birds with this condition is unthriftiness.

Another type of coccidiosis which is very common appears to be due to one of the commonest coccidia of chickens, *Eimeria acervulina.* These coccidia develop in the upper portion of the small intestine, and may extend to the middle and in rare cases to the lower portion. The chief lesions of this infection appear as small whitish grey spots in the mucous membrane of the intestine. These greyish spots contain coccidia. The intestine is usually filled with a thick mucus containing a large amount of epithelial tissue and oöcysts. Hemorrhages may appear, but are rare. This condition causes unthriftiness, weakness, anemia and death.

Coccidiosis may be due also to another common species, the *Eimeria maxima.* This parasite inhabits the middle portion of the small intestine, causing a thickening with hemorrhages in this portion accompanied by thick mucus tinted with blood.

An invasion of the bird usually does not produce symptoms until the 4th or 5th day, with death occurring a short time after symptoms are noticed. In the case of *Eimeria tenella,* which involves the ceca only, the symptoms usually appear on the 4th and 5th days after a bloody diarrhea, and the greatest number of losses occur on these days. Birds that live until the 7th day after infection, which would be 2 to 3 days after showing symptoms, usually do not die. In forms such as *Eimeria mitis, acervulina* and *maxima,* symptoms usually develop on about the 6th or 7th day after infection, and losses occur on about the 8th or 9th day. Any birds living until about the 10th day or 2 or 3 days after symptoms are noticed usually do not die. At the time the symptoms are noticed, oöcysts appear in large numbers in the droppings. The oöcyst form which is passed in the droppings is not in itself infective. Sporulation occurs in approximately 24 hours outside the animal body if conditions are favorable, resulting in the sporozoite, which is the infective stage of coccidia. This affords a very good chance for infection of healthy birds and reinfection of birds that have passed through a previous infection. Since the oöcysts sporulate in 24 hours, it is possible to avoid reinfection by removing birds from the source of infection. Coccidiosis is a self-limiting disease; that is, if birds are removed from the initial source of infection and are not allowed to be reinfected, they will spontaneously recover. In this disease, therefore, sanitation is one of the greatest assets so far as treatment is concerned. Birds should be put on wire if possible, or the droppings should be cleaned from the houses at least every 24 hours for 7 days, the usual time required for the coccidia to complete their life cycle. The combination of beta-naphthol and quinine sulphate used in the mash, together with a large percentage of sour milk, buttermilk or other milk products, has proved to be beneficial, provided the proper method of sanitation is carried out.

Aspergillosis

Aspergillosis is a disease of the pulmonary region due to an infection by a fungus, *Aspergillus fumigatus,* which is found on moldy grains or moldy litter. Birds scratching in this material inhale the spores, thus causing the infection. It is characterized by an exudate usually of a moldy appearance on the mucous membrane of the air passages principally of the air sacs.

The symptoms vary, and as a rule the condition has existed some time before symptoms appear at all. When the lesions are located in the trachea or in the bronchi, rattling in breathing or rasping in the throat may be the only indication of infection. When involvement is in the air sac alone, only the respiratory symptoms are noted. As the disease progresses, however, the birds become dull and listless, the appetite decreases, they become emaciated, and, in the later stages, diarrhea is usually present. In baby chicks, the disease occurs rather early and may be confused with pullorum disease but lesions on post mortem are entirely different, pullorum disease very rarely affecting the air sacs. The disease is called brooder pneumonia in young chicks. Treatment is of no avail. Proper precautions as to the use of moldy litter or feed should be exercised.

Fowl Typhoid

Fowl typhoid is a specific infectious disease of fowls that is caused by *Salmonella gallinarum.* This is a disease which usually appears during the hot, dry months, very seldom making its appearance during the colder or rainy seasons. It is usually slow in gaining a start, so that losses may be mild for as long as two weeks, but gradually it spreads through a flock, causing very severe losses. In a mixed flock of adult and young chickens, the disease is apt to appear first among the mature birds and then to clear up among them while the loss is only starting or just reaching its peak in the young birds. The losses in young birds are much greater, since many mature chickens seem to be immune or at least resistant. Symptoms are: gradual progressive weakness and inactivity, jaundice, diarrhea, paleness of comb and wattles, and elevation of temperature. Death occurs from a day to a week after the first symptoms are noticed.

The lesions are a severe catarrhal enteritis, hepatitis, and emaciation in more chronic cases. Typhoid is the only acute infectious disease in chickens over two months of age in which there is an enlargement of the spleen. The spleen is enlarged in 100% of acute cases, or about 95% of all cases. The liver is enlarged and soft, friable, easily broken, and mottled with various colors, mostly shades of dark brown and lighter brown and yellow, or brown and bronze. From the cut or torn surface of the liver, the blood drops thin, watery, yellowish, or dirty looking. White circumscribed nodules are often found in the myocardium. These nodules may vary from the size of a pin head to that of a pea or larger. They appear to differ in no way from the nodules found in bacillary white diarrhea. The enteritis present shows nothing specific. Acute congestion of the intestine is absent. The lesions of the liver are to be differentiated from those seen in acute cholera. In cholera the liver is firm; in typhoid it is soft. Cholera causes a diffuse coagulation necrosis, while in typhoid a diffuse fatty degeneration is shown. The liver is not greatly enlarged in cholera. It is rather questionable if geese or ducks are ever affected with typhoid.

Fowl Cholera

Fowl cholera is an acute, infectious, specific disease due to a bipolar organism, the *Pasteurella avicida*. It is a very common disease in wet and cold weather, but very uncommon in dry weather. It is almost never seen in brooder chicks. It occurs in two principal forms, namely, septicemic and localized. The septicemic form is more common and often causes very rapid and heavy losses. Birds may be sick from a few minutes to two days, or they may be found dead about the premises without any signs of sick chickens within the flock. There are very few symptoms noticed in the acute septicemic form as birds usually die before showing symptoms. The septicemic form is characterized by intense congestion of the organs with much evidence of petechiation. Upon opening a bird, the most noticeable lesion is an intense hyperemia of the abdominal organs. The ovaries and oviduct show a very intense hyperemia. The liver is highly congested in most cases, and shows many pin point areas of necrosis on its surface. In some cases the liver is rather light in color, showing some characteristic areas of necrosis. The serous surfaces often show petechiation, particularly over the fat of the abdomen. The peritoneal cavity may contain an exudate resembling light-colored, boiled egg yolk. The spleen and kidneys show some congestion. The lungs may be normal or slightly congested. The pericardial sac is usually filled with a straw colored serum. The pericardial attachment to the sternum always shows petechiation. The heart may or may not show petechiation in chickens, but in ducks and geese, this petechiation is always present, and is diagnostic for the disease of septicemia in the latter species. The intestine shows a severe inflammation, with petechiation of the anterior portion of the duodenum.

There are many localized forms, or forms in which a local condition is present, where the predominant organism isolated is the characteristic bipolar organism.

One of the more common localized forms is a cold or roup-like form characterized by a thick, sticky exudate about the beak and nostrils. This is differentiated from roup in that a few septicemic cases will always be observed in the flock, and that the birds die more quickly than they do with roup.

Another localized form is edema of the wattles. In these cases, the wattles show a rapid swelling without any apparent cause, becoming red and hot. This is common in male birds with large wattles.

The third localized form, otitis media, is characterized by yellow cheesy exudate found in the internal ears and within the bones at the base of the brain. The birds show various symptoms, lacking ability to use their necks or to control the movements of the head.

The arthritic form is characterized by the production of the cheesy exudate in the joints or in the tendon sheaths about the joints, which become swollen, warm, and painful. The joints of the leg are most often affected, although the condition has been observed in those of the wing.

The ovarian or peritonitis form is more

acute than the other localized forms, and is characterized by a firm, yellow, cheesy exudate about the ovary and in the peritoneal cavity. This exudate appears very much the same as boiled egg yolk. It must be differentiated from rupture of the ova and injury to the reproductive organs. This lesion is frequently found in many birds suffering from the acute type of infection.

Another form may be termed the tracheal. In this the birds show symptoms very similar to those shown by birds with infectious tracheitis. It may be differentiated from tracheitis by isolating the bipolar organism from the trachea and by the fact that many acute septicemia cases will develop within the flock. However, infectious tracheitis and fowl cholera may both be present in the same flock, making differential diagnosis difficult.

Goose septicemia or cholera is one of the commonest diseases of geese. It will be discussed in more detail later.

Respiratory Diseases

These are most prevalent during the housing season and are diseases which in all probability present more difficulty in satisfactory treatment than any other group of diseases of birds. The most common among these are colds or roup. These simple, nonspecific diseases, are probably due to faulty housing, since losses are usually light in properly housed flocks and heavy in damp, overcrowded or poorly ventilated houses. If a heavy loss from a respiratory disease occurs in spite of good conditions, it is an indication that it is one of the specific respiratory diseases to be mentioned later.

Swelling of the sinuses and eye, or tissues about the eye, and discharge from the eyes, nostrils and mouth all indicate roup, but it should be remembered that these may also be present in all other respiratory diseases so that a diagnosis must be made chiefly from the history.

Fowl Pox

This disease is quite readily recognized by the characteristic formation of pox lesions about the head and face. However, in pox as well as in canker, there may be a swelling of the tissues about the eye with a filling of the sinuses of the head and conjunctival sac manifested by a distinct bulging, and with the formation of diphtheritic membranes in the throat. The causal agent is a filterable virus.

The mortality in fowls affected with the mouth form may vary up to 90%, but among those where lesions are confined to the skin, the mortality rarely exceeds 10%. In most outbreaks of any extent, both types of lesions occur. The growth of the affected fowls that do not die from the disease is seriously interfered with. They become emaciated, and there is a temporary stop to egg production. The disease may be transmitted by direct contact of healthy with diseased birds, or by contact with infected premises and by mosquitoes and biting flies.

Fowl Pox Vaccination.—There are four methods of vaccination in general use in America, as follows:

1. Scarification method, done by scarifying a defeathered area, lateral to the tibia, which has been previously brushed with suspension of virus.

2. Follicle method, by the introduction of a suspension of virus into the feather follicles by use of a camel's-hair brush. Three to six follicles should be vaccinated. This appears to be the most popular method.

3. Subcutaneous method, the subcutaneous injection of virus. In many cases the lesions do not develop at the point of inoculation but in other points, creating uncertainty as to the results or takes.

4. Stick method, the principle of which is to produce a break in the skin and simultaneously introduce the virus.

Immunity.—The time required for development of immunity varies in individual birds, but it is usually about four weeks. Complete protection is not maintained over an extended period of time. The use of fowl pox virus produces a more lasting protection than does pigeon pox virus; pigeon pox virus, however, does not cause as great a constitutional disturbance as does fowl pox virus.

Fowls should be vaccinated at the age of 30 to 90 days. They should not be vaccinated at a time when they are in egg production, or within three weeks of beginning

to lay. The use of fowl pox virus is not advised on a clean farm even though there may be a threat from a neighboring center.

Tracheitis or Infectious Bronchitis

This is a disease very much like canker in which pseudo-membranes may or may not be found in the mouth. It spreads faster and is more highly contagious than canker and is differentiated by the presence of large amounts of exudate, or exudate and blood, in the trachea, together with severe acute tracheitis and bronchitis. Death often results from suffocation due to plugging or hemorrhage of the trachea or bronchi or to a plug of exudate in the larynx. Turkeys are susceptible to roup, canker and pox. Vaccination method by use of an attenuated virus introduced into the bursa of Fabricius of the cloaca has not given uniform results as to percentage of takes and the giving of a lasting protection.

Tuberculosis

This is an infectious disease closely related to the same disease in other types of livestock characterized by the formation of tubercles, principally on the visceral organs.

Symptoms.—Until the disease has developed sufficiently to cause evidence of emaciation, there are no characteristic symptoms except in cases in which the joints are involved. Anemia and emaciation are constantly present in advanced cases. The birds become weak and move about very little. The eyes appear to be bright and the appetite normal even in advanced cases. Emaciation is the most striking symptom of the disease. Lesions in the liver and spleen appear as small tubercles of white or greyish nodules.

Nutritional Diseases

This group of diseases is very often seen in young birds, especially in the form of leg weakness, due to lack of sunshine or lack of minerals or vitamins in the feed or both. The specific lesions are weakened and misshapen bones, most noticeable in the leg and thorax, which are weak, bent, and easily broken.

Nutritional roup characterized by inflammation of the eyes occurs in young chicks. The specific lesions are gluing of the eyelids with little or no general disturbance, or the presence in the conjunctival sac of a yellow cheesy exudate which is easily removable. There is no acute inflammation present. When the eyelids are opened and the exudate is squeezed out, the affected chick is quite active and eats well. The chicks always eat as long as they can see. Young growing ducks are quite often apt to suffer from insufficient bone materials in the feed, or from lack of vitamins.

Visceral or articular gout is a disease which is very often encountered in turkeys where they are kept in close confinement and fed on an extremely heavy protein diet. The most prominent lesions in the visceral form are: the serous membrane of the chest and abdominal cavities is covered with a layer of whitish uric acid crystals as are the pericardium and pericardial sac or the heart muscle. The articular form occurs in the joints of the feet as well as in those of the wings. The joints become thickened and inflamed while the joint capsule shows swelling. These may become large enough to rupture, discharging a thick whitish material composed of uric acid.

Avitaminosis

This is a disease occurring very frequently in turkeys and quite often in chicks due to a lack of vitamin A in the diet. The birds become emaciated and the characteristic lesions produced are small, whitish, ulcerative areas in the mouth, extending down the esophagus into the crop. These areas appear quite similar to those found in canker except that in canker they are confined to the head and respiratory passages.

Fowl Leucosis

Fowl leucosis, which is also known by the names of range paralysis, neuro-lymphomatosis, Gallinarum, and many others, is a highly fatal, transmissible disease of fowls characterized by a pathological proliferation of embryonic blood cells.

Etiology.—The disease is due to a filterable virus. Leucosis can be transmitted from diseased to healthy birds by pen contact or by contact of healthy birds with infected litter or premises. It is easily transmitted by injection of cell extract, filtrates,

and glycerinated filtrates or cell extracts. Considerable evidence has been obtained that strongly suggests its transmission through the egg, although this has never been conclusively proved. The disease usually causes greater losses in chickens about 6 to 9 months of age. There is a marked difference in the degree of resistance and susceptibility between chickens of the same strain and of different strains of virus. It appears that these factors in fowls are inherited.

The disease is usually fatal. A complete recovery is rare, although temporary respites are noted. The course is variable; in a small percentage of cases the disease runs a rapid fatal course, while in others it is very long with all degrees between these limits. The general tendency, however, is toward a long course. Fowl leucosis is also variable in regard to location of lesions, extent of involvement, degree to which involved tissue is affected, and types of pathological tissues involved. Practically any organ or tissue may be involved. Lesions may be found in the following locations: eyes, nerves, brain, cord, liver, bone marrow, spleen, ovary, testicle, oviduct, adrenal glands, gall bladder, thymus glands, parathyroids, bone, muscle, skin, pancreas, intestine, ceca, mesentery, blood vessels, lungs. In some cases lesions may be found in a large percentage of the above; in others, in only one.

The disease may be classified into various types: 1. According to pathological tissues involved as: a. Lymphoid-like; b. Erythroid; c. Myeloid; d. Mixed. 2. According to location of lesions as eye, nerve, mixed. 3. According to course as acute, subacute, chronic.

Classification by Tissues Involved

Lymphoid-like type.—This type is characterized by a diffuse infiltration of lymphoid-like tissue into affected tissues or organs. This type of pathological tissue is grey or yellowish-grey in color and rather soft; it causes an enlargement of the filtrated organs. The organs most frequently affected are nerves, kidneys, spleen, liver and ovary. The cellular elements are lymphoid-like cells, presumably lymphoblasts. The type of lesions found are identical with those of lymphosarcoma and round cell sarcoma tumors.

Erythroid type (*Erythroleucosis*).—This is characterized by occurrence of premature erythrocytes in the general blood circulation and other organs, principally the liver, spleen and bone marrow. The involved organs are swollen, enlarged and have a peculiar red, brown or grey appearance.

Myeloid type.—This is characterized by an infiltration of soft, loosely arranged, light grey or white myeloid tissue into affected parts. The infiltrations may be diffuse or nodular. The organs principally affected are bone marrow, liver, spleen and kidneys. They are enlarged, reddish-brown in color. The blood shows an increase in premature leucocytes of the granular series, principally myeloblasts and myelocytes. There may be a great variation in cases belonging to the myeloid type and the above locations are those only of typical cases.

Classification by Location

Eye type.—The eye type is characterized by a depigmentation of the iris and constriction of the pupil, although in some cases the pupil may remain normal or become dilated. Blindness frequently occurs. The normal reddish-bay color of the iris changes completely or partially to a grey or slate color. This may occur in one or both eyes. Typical clear-cut manifestations of this eye change are diagnostic, and diagnosis in the field is not difficult.

Nerve type.—The symptoms vary according to the location of the nerve tissue and degree of involvement. Slight to severe lameness in one or both legs or wings is a common symptom.

The infected nerves enlarge and lose their white glistening appearance, becoming dull grey or yellow in color. Practically all nerves, cord and brain may be affected. The lesions may be so slight in some birds that it is necessary to autopsy several before a diagnosis is made.

Differential diagnosis.—In erythroleucosis cases a characteristic anemia with icterus is noted. In case the blood is involved sufficiently a positive diagnosis may be made by examining a blood smear. A nega-

tive blood picture, however, does not always mean that a bird is not infected, as the blood picture is largely dependent on the degree of bone marrow involvement.

A diagnosis may be made by finding lesions of tumors or liver changes, as stated above.

Various combinations of various types frequently occur, rendering a positive classification into one type impossible. However, since these various types seem to be merely different expressions of the same disease, a positive classification of type is of little significance from a purely clinical standpoint. Lameness due to leucosis, however, must be differentiated from lameness due to tuberculosis, localized fowl cholera, injuries of joints and articular gout. This must be done by finding the lesions of the respective diseases.

Control.—The most important factors in the control of fowl leucosis in our present state of knowledge seem to be as follows:

Eliminate infected birds as soon as noticed and attempt to build up resistant strains by process of elimination and selection of breeding stock. When new breeding stock is introduced, select it from strains highly resistant to leucosis, if possible. This may be done by selecting healthy birds from flocks which have shown evidence of infection. Rear chicks on clean ground away from other poultry, and enforce strict sanitary and hygienic measures.

Infectious Enterohepatitis

Infectious enterohepatitis, commonly referred to as blackhead, is the most important disease of turkeys, causing a high percentage of the death losses. In fact, infectious enterohepatitis might be called *the* disease of turkeys as goose septicemia could be termed *the* disease of geese. This disease is due to a protozoan parasite, *Histomonas meleagridis.* The marked symptoms are progressive weakness, diarrhea, anemia and emaciation. Although the disease is also known as blackhead, the head is usually any other color than black.

It often seems to make its appearance very suddenly or after the purchase of new stock, but it may be present in a flock for a number of years, becoming more destructive each year. The disease is more rapidly fatal and causes a higher loss in young birds than in mature birds. The specific lesions are confined to the liver and the intestines, primarily the ceca. The liver contains necrotic areas of varying size, up to as large as one inch in diameter. The liver tissue between the areas appears to be more or less normal. When viewed from the surface of the liver, these necrotic areas are sunken or depressed and are circumscribed by a border or boundary of acute inflammation. The outline of the areas is in general circular, although the border is usually rather irregular. The ceca are generally swollen and distended, with great masses of exudate, cellular débris, and old or recent hemorrhagic products. The inflammation is so extensive that the ceca may adhere to the other viscera. In some cases the small intestine may show severe inflammation, but this is rather unusual.

The problem presented in controlling this condition is purely a sanitary one; that is, turkeys should be raised apart from chickens and on ground where chickens have not been allowed to range, since chickens, although practically immune to the disease, are frequently carriers of *Histomonas meleagridis.*

Paratyphoid Infection of Turkeys

Paratyphoid of turkeys is a most important infectious disease, causing an extremely high death loss in young poults under five weeks of age. Marked symptoms are extreme weakness, drowsiness, diarrhea and coma. It usually makes its appearance suddenly and is rapidly fatal. It may occur in older birds but in them is not accompanied by as high a death loss as in young birds. The specific lesions are confined to the ceca, liver, kidneys and intestine. The ceca are usually distended and enlarged, with great masses of cellular débris and exudate. This material appears as a mass of firm, cheesy, coagulated material. The small intestine usually is highly inflamed and inflammation of the liver and kidneys is often noted. Paratyphoid may be differentiated from blackhead by the absence of necrotic lesions in the liver and by the early

age at which paratyphoid causes the most severe loss.

The disease is readily transmitted to turkey poults by contact of healthy with diseased birds or by infected premises. The organism readily kills rabbits, guinea pigs, chicks, turkey poults and adult turkeys when fed or injected experimentally. It may be controlled by use of proper sanitation and management.

Goose Septicemia

This infectious disease causes probably 90% of the losses in geese over two months of age. It is due to the characteristic Pasteurella organism and always occurs in a septicemic form. Birds usually show no symptoms but are found dead and upon autopsy the characteristic lesions are severe septicemia, characterized by hemorrhages on the heart and in the abdominal tract as well as small areas of necrosis within the liver. Turkeys also are affected with this disease, usually in the septicemic form.

Internal Parasites

Chickens are affected with various intestinal parasites such as tapeworms, roundworms, capillary worms and cecal worms. Diagnosis depends upon the finding of the parasite. Particular care should be taken to look for the very small parasites, such as the capillary worms and tapeworms. Chickens are also affected with gizzard worms and with crop worms, the crop worm being a small species of nematode which is very difficult to observe unless extreme care is exercised in searching for this parasite. Also, a great deal of care should be taken to examine for the small nematodes which occur in the proventriculus.

Air Sac Mites.—Diagnosis depends upon finding the small mite in the air sacs. Connective tissue mites or subcutaneous mites produce small, yellow, slightly flat, elongated nodules about the size of a pinhead in the subcutaneous tissue.

External Parasites

Poultry are often infected with lice and various types of mites including the feather mite and the scaly leg mite. Diagnosis is usually made by finding the parasite, except in the case of the scaly leg mite where the lesions produced are usually sufficient for a diagnosis.

Non-Specific Enteritis

This includes almost all inflammations of the intestine which are not truly specific. This is a very important and common condition seen at any time of the year. Fatalities in young birds may reach as high as 15 to 20%, but the greater loss from this condition is due to unthriftiness. The specific lesion is an acute or chronic enteritis without lesions of other diseases and without the presence of internal parasites. Goslings of a few days of age are very susceptible to enteritis and indigestion.

Tumors

Domesticated birds are also subject to tumors, which usually affect mature birds. The symptoms shown are generally not diagnostic, but the lesions found are specific and diagnostic. The liver, ovary, spleen and pancreas are usually the organs affected. These organs are enlarged, to an extent depending upon the amount of tumor growth, light in color, and slightly firmer than normal. Tumors appearing in muscles are usually light-colored, firm and circumscribed. Tumors in nodular form in the liver, spleen or intestines may often be mistaken for tubercles of tuberculosis.

Poisoning

Birds frequently die of poisoning, and although the condition may be recognized readily, it is often difficult to identify the specific poison. Chickens dying of poisoning are sick from a few minutes to a few hours, depending upon the amount and type of poison consumed. Phosphorus poisoning, which usually affects birds around the Fourth of July when this material is obtained from various types of fireworks, may be detected by the glowing appearance of the gizzard in a dark room. Poultry may also ingest phosphorus from rat poison. There are many other drugs or poisons, as well as poisoned or spoiled feed which cause losses in poultry. Some common to all poultry are: concentrated solutions of magnesium sulfate fed to thirsty and young chicks, potassium permanganate in concentrated form, and lead arsenate.

Drugs Used in Veterinary Medicine

IX. PURGATIVES

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Historical

Man's troubles in the region of the digestive canal have been attributed to habits acquired in civilization. That our domesticated animals have acquired similar weaknesses should not be surprising, for they too may be considered as partaking of the habits of civilization. Their change in general habits, varied diet, and inactivity have brought about the problems that confront the practitioner today.

The ancient Egyptians followed a regular program of emesis and purging. They believed that all ailments arose from food, and it was therefore natural when disease occurred, that they should devise some means of purging the system. As one reviews the literature, he finds "purging calendars" which prescribed a regular monthly "house-cleaning". Some people purged themselves more often. This custom has been carried down to us—for is it not the common practice for our layman, often with the advice of his physician, to give himself a thorough cleaning out? It may be considered as another kind of blood-letting, for purgation is a form of systemic depletion.

If we would consider constipation as one of a series of symptoms, instead of a disease entity, we might change our viewpoint. We might allow the intestine to perform its normal function (while it *is* normal) without outside influence.

In Queen Elizabeth's time, energetic purgatives in the form of pills were used fortnightly. Entire households were subjected to this treatment, and everyone "retired for physic." Originally enemata were administered by apothecaries, but later this "privilege" was passed along to the barbers, as was "cupping".

Brunton states that he has "very little doubt that the ancient Britons, who lived upon pig-nuts, acorns, and such other things, did not suffer from constipation, even though the acorns contained a good deal of tannin, because the quantity of indigestible food which they swallowed was quite sufficient to stimulate the bowels and produce evacuation without the addition of any purgative." One recalls that the Roman troops carried with them a small handmill for grinding wheat. This insured them a supply of indigestible residue which is in direct contrast with our finely ground and refined wheat products, which lack the very thing that these ancient people recognized as essential. Three things, whisky, syphilis and fine, white flour, have been named as the responsible factor in the decline of the American Indian.

To say that man, as he progressed and met with these alimentary problems, should have looked about in his natural environment for succor, is quite natural. He found it in great abundance, not only in the juices or other parts of plants, but also in mineral matter occurring in springs and in solid forms. For example, Johann Rudolph Glauber discovered the salt bearing his name (sodium sulphate) during the middle of the seventeenth century; and Friederich Hoffmann discovered a mineral spring at Seidlitz, Bohemia, which owed its medicinal virtues to a combination of magnesium and sodium sulphates, from which an artificial powder, since then prepared, obtains its common caption, seidlitz powder.

The history of the natural plant products is too long to consider here, though it is full of romantic interest. One—aloes—has already been discussed in these pages (August, 1935).

General Considerations

Cathartics, or purgatives, produce their effects in various ways, directly, by exciting or accelerating the peristaltic functions, indirectly, by lessening normal absorption, or by increasing the secretions of the intestinal glands, thus keeping the contents of the intestine bulky and fluid.

An abnormal degree of active peristalsis prevents the intestine from concentrating its contents by absorption of fluid. On the other hand, the accumulation of large quan-

tities of fluid material within the intestine is recognized as reflexly exciting peristalsis. Thus even a comparatively slight interference with reabsorption, may result in a sufficient amount of liquid material reaching the rectum to cause a soft stool. When the absorptive functions are almost entirely inhibited, the diarrhea that occurs causes sufficient loss of body fluid to concentrate the blood markedly.

Ideally, a cathartic or purgative should not act appreciably upon the gastric mucosa, but should act on reaching the intestine. There it should be transformed into a substance that favorably affects either secretion or peristalsis, or both; not, however, in too great excess. The pancreatic juices and the enzymes otherwise present help in this transformation, and even the bile plays some part. Farther down, in the region where putrefactive changes occur, in the large gut, the activity of the bacteria plays a further part in this transformation.

Since true cathartics or purges act because of the reactions they cause on the surface of the intestinal mucous membranes, their efficiency depends largely on the power with which they act throughout the length of the intestine itself. The less a cathartic is absorbed, the greater, in general, is its efficiency, for this means more surface exposure to the action of the drug.

Classification

Purgatives, or cathartics, may be classified as to their physical or chemical properties, their site, mode, and degree of action. The arrangement listed below blends the latter two bases, namely, the mode and degree of action.

1. The lubricant or mechanical laxatives.
2. The simple laxatives.
3. The cathartics or simple purgatives.
4. The hydragogue cathartics.
5. The drastic purgatives.

I. The Lubricant or Mechanical Laxatives

These either lubricate the bowels or soften the consistency of the intestinal contents. Furthermore, certain members of this group increase the volume of evacuations by the absorption of fluid. The increase in volume stimulates peristalsis. These substances are either oily or mucilaginous and are neither digested nor absorbed. According to Bastedo, the use of certain indigestible oils, such as mineral oil, is not without danger; especially when administered close to feeding time, for the oil-soluble vitamins may be withdrawn from the food within the digestive tract and lost to the animal during evacuation. This would involve the important vitamins A and D, as well as E.

Liquid Petrolatum (white mineral oil; liquid paraffin). A mixture of liquid hydrocarbons; a colorless, oily, nearly odorless and nearly tasteless liquid; insoluble in water and alcohol. It may be of a "heavy" or "light" grade. Internally it lubricates and increases bulk, has no nutritive value, and is not absorbed. Externally, it is used as a vehicle for drugs applied to the skin, nasal passages and throat.

Dose

H & C	℥viii—Oii	250—1000.
D	ʒi—ʒiv	4— 16.
Cat	℥ss—℥i	2— 4.

There is an emulsion of liquid petrolatum with phenolphthalein, a spray, and two petroxolins official in U.S.P. or N.F.

Agar (agar-agar) is a mucilaginous substance extracted from certain seaweeds obtained from Japan. It consists of nearly white, odorless, tasteless strips or shreds, brittle if dry; insoluble in cold water, but slowly soluble in hot water. This drug passes through the intestine unchanged; absorbs and retains moisture, rendering the feces soft and bulky, and thus promoting peristalsis. It may be given in the same dose (by weight) as liquid petrolatum, or even increased considerably.

Plantago Seed (psyllium or plantain seed) is the dried, ripe seed of a plantain plant native to the East Indies. These black or blond seeds, like agar, serve as mucilaginous laxatives because of their gelatinous character, affording bulk and lubrication. They swell easily when immersed in water. In addition, some attrib-

ute their action to a slight mechanical irritation caused by the rough seed-coat. The dose is practically the same as for agar. Water should be given with it.

II. Simple Laxatives

These are the simplest of the true cathartics, and are also known as aperients. They merely loosen the bowels and cause soft stools by their mild irritation. Authorities vary in their use of the term laxative and purgative, as well as of cathartic, but actually the degree of activity depends upon the dose. For our purpose we will consider certain vegetable oils and drugs which contain the anthracene or anthraquinone groups. The latter are known as tonic laxatives.

Certain of the milder-acting vegetable oils such as those listed act by forming soaps in the digestive canal and cause mild irritation. Though some of the oil is absorbed if given in large enough dose, sufficient material will be left to do its work.

The anthraquinone or emodin group acts because of its active glucosidal content. The glucoside is probably released in the digestive tract, since emodin itself is not a laxative. Their essential effect is to increase peristalsis. Some, such as aloes and senna, act on the large gut, whereas others act on both the small and large intestine.

Olive Oil (sweet oil), *Cotton Seed Oil, Linseed Oil (Flaxseed Oil)*. These oils are digestible and nutritive, and serve only as mild laxatives when present in excess. Their activity is due mainly to the small amount of soap formed in the intestine.

Cascara Sagrada (*Rhamnus purshiana*), a dried bark.

Buckthorn Bark (frangula bark), a dried bark.

Buckthorn Berries (*Rhamnus cathartica*), the ripe fruits.

Rhubarb Root, the rhizome and roots.

Senna, the dried leaflets.

Manna, a dried sugary exudation.

Aloe, the inspissated juice, dried.

This group of anthraquinone or emodin-containing drugs increases peristalsis, does not draw water from the intestine, and may be absorbed without harm. The main action of this group takes place in the colon, and the action appears to be augmented (Bastedo) when given in alkaline media (as with sodium bicarbonate). When there is a deficiency of bile, as in jaundice, they may fail to act. Mild griping characterizes this group, probably because of the presence of some resins.

Aloes contains irritant resins and for this reason is much more violent in its effects than the others of the group. Aloin is devoid of these resins, but is a much more active tonic laxative. Aloes must be given with caution in pregnant animals, as it may induce abortion. In the case of buckthorn bark (frangula) in addition to its cathartic principles, it contains amygdalin, a bitter glucoside which makes it stronger than cascara sagrada, and is favored by many veterinarians for this reason. Senna is apt to cause griping.

Dose

Linseed Oil:		
H & C	Oi—ii	500—1000.
Sh. & Sw.	℥vi—xii	180—360.
D.	ʒii—℥i	8—30.
Cotton Seed Oil:		
D.	℥ss—ii	15—60.
Cat	ʒi—℥i	4—30.
Olive Oil (sweet oil):		
D.	℥ss—ii	15—60.
Cat	ʒi—℥i	4—30.
Cascara Sagrada:		
Extract	D gr. iii—viii	.18—.5
Fluid Extract	D m. xv—xxx	1—2.
Buckthorn:		
Fluid extract	—D ℥ss—i	2—4.
Syrup (of berries)	D ʒi—iv	4—15.
Rhubarb:		
H (as stomachic)	ʒiiss—vi	10—25.
Sh. & Sw.	℥iss—iii	50—100.
D.	ʒi—iv	4—15.
Cats	gr iss—ʒi	.1—4.
Senna and Fluidextract Senna:		
H & C	℥iv—v	150—120
Sh. & Sw.	℥i—ii	30—60.
D & Cat	ʒi—iv	4—15.
Aloes:		
H.	℥ss—iss	15—45.
C.	℥iss—iiss	45—75.
Sh.	ʒiiss—vi	10—25.
Sw.	ʒi—iiss	4—10.
D.	ʒss—i	2—5.
Cat	gr iii—xv	.2—1.
Aloin:		
(usually combined with other purgatives)		
H & C	ʒii—iii	8—12.
D.	gr ii—xx	.12—1.3

III. The Cathartics or Simple Purgatives

This group is, in general, more active than the former and might include practically all the former when given in larger doses. These drugs produce frequent, loose and watery evacuations.

Phenolphthalein is a white, odorless powder, tasteless, almost insoluble in water, but soluble in alcohol. It is an artificial coal tar derivative, and is fairly reliable though it may cause griping in the lower gut. It is recommended largely in small animal practice in doses ranging from ¼ to four grains. It is present in many chewing gum and chocolated tablets, and in pill form. It is also prescribed with emulsions, as a synergist. It turns pink in the presence of alkalis and may give the urine and even the feces, a reddish color.

Calomel (hydrargyri chloridum mite or mercurous chloride) is a white, odorless powder, insoluble in water and alcohol, incompatible with alkalis, bromides, iodides and strong acids. It is a slow-acting, fairly powerful, non-irritant cathartic. It acts mainly in the upper portion of the intestine, and for this reason should be followed by a saline purge. It is not, as formerly believed, changed to the toxic mercuric chloride, but rather to a carbonate, oxide or hydroxide of mercury. For this reason it is not necessary to give alkaline salts with it. Fractional doses taken at short intervals are more efficient than a large dose taken at once. The size of dose is no criterion for proportionate effect. If calomel remains in the system for any length of time, mercurial poisoning may result. Always follow calomel with a saline purgative. Calomel is principally recommended for small animals.

Dose

H & C	ʒiss—ii	6—8.
D.	gr ss—iss	.03— .1
Cat	gr 1/10—1/5	.006— .012

Sulphur (sublimed sulphur, washed sulphur, precipitated sulphur). All forms consist of a yellow powder, insoluble in water. Internally, it is partially transformed into sulphides and hydrogen sulphide, which leads to its purgation because of the irritation that it produces. The feces are offensive in odor. Some of the sulphur is absorbed and excreted through the kidney, skin and lungs, the expired air having a disagreeable odor. Precipitated sulphur is the most favored form for animals.

Dose

H & C	℥ii—iv	60—120.
Sh. & Sw	℥i—ii	30— 60.
D.	ʒss—iv	2— 15.

Castor Oil (oleum ricini) is the fixed oil obtained from the castor plant. The seeds, from which the oil is obtained, are extremely poisonous. Since the plants are often cultivated by farmers who do not know its nature, humans and animals have been killed by ingesting only a few of these dangerous seeds. Seven of them have been known to kill a horse! The oil is expressed from the seed by a cold process, which leaves in the residue the highly toxic principle known as ricin. This is water-soluble, so that when the seeds are chewed by the animal, the toxic substance is extracted and absorbed. The oil acts by irritating the intestine and to a slight extent also acts on the large gut. The soap that is formed (a ricinoleate) is quite irritant and causes some griping. It takes several hours (from four to six) to act and is often followed by constipation. This is a disadvantage of an otherwise useful drug. Modern methods have given us the soft gelatin capsule with the oil.

Dose

H & C	Oi	500
Sh. & Sw	℥ii—iv	60—120.
D & Cat	℥i—ii	30— 60.
Poultry	ʒi	4.

IV. Hydragogue Cathartics

These are principally the saline purgatives and produce fecal discharges containing large amounts of water. They act mainly by drawing fluids into the intestinal tract and preventing their reabsorption. In doing this they cause some irritation, but undoubtedly some of their effect is due to an increased fluid content which induces active peristalsis. Without much food, they act within a half to one hour after administration. They include numerous salts of the alkali or alkaline earth group. Most

powerful of the saline purgatives is magnesium sulphate, followed by sodium sulphate, sodium phosphate, and magnesium citrate in the order named. Since these salts are practically not absorbed at all, they are very efficient in their action. Since they withdraw large amounts of water from the tissues, and may cause undesirable depletion; it is essential that the saline cathartics be given with an abundant supply of water. This hastens their action, which otherwise would be slow because of fluid withdrawal from the intestinal wall. Saline purges do not appear to be as dependable for horses as for smaller animals. They are often given with the liquid anthelmintics, to avoid poisoning. In some cases, as when for some reason peristalsis is absent, saline purges have been known to poison because of absorption.

The two most popular saline purges in veterinary medicine are magnesium sulphate (epsom salt) and sodium sulphate (Glauber's salt). They are popularly employed in ruminants. For horses, artificial Carlsbad salts have been used for many years, and even cage birds are benefited by a few grains per ounce drinking water. The formula is: 40 parts sodium sulphate; 35 parts sodium bicarbonate; 15 parts sodium chloride; 2 parts potassium sulphate. For horses, give one or two heaping tablespoonfuls on the feed about three times a day.

Dose

Magnesium Sulphate (Epsom salt):		
H.	lb. ss—ii	250— 500.
C.	lb. i—ii	500—1000.
Sh. & Sw.	℥ii—iv	60—120.
D.	ʒiiss—℥ii	10— 60.
Cat	ʒss—i	2— 4.
Fowl	ʒss—i	2— 4.
Sodium Sulphate (Glauber's salt):		
H.	℥ii—iv	60— 120.
C.	lb. i—iss	500— 750.
Sh.	℥ii—iv	60— 120.

V. The Drastic Purgatives

As the name implies, these are by far the most active of the cathartic drugs. They produce copious watery discharges, usually accompanied by griping. The action is mainly due to an irritant principle that they contain. Very often this group of medicines is absorbed and later excreted through the kidneys, which are irritated. Large doses cause such marked irritation that the feces become bloody, and this may be followed by collapse and death. In pregnant animals, such drugs may cause abortion because of the ensuing pelvic congestion. They should not be employed where inflammation of the digestive tract has already occurred. If prompt evacuation of the bowels is desired, they may be used.

Some of the active principles are resins, others are glucosides, and still others contain acids. Their action usually begins in the stomach and continues throughout the digestive canal, the effect coming in from one to three hours.

Jalap, the dried tuberous root (resins and glucosides).

Colocynth (bitter apple), the pulp of the fruit (resin and alkaloid).

Podophyllum (mandrake), the roots (resin and other principle).

Gamboge (cambogia), a gum resin (active acids).

Elaterin (from squirting cucumber), a neutral principle from the juice.

Croton Oil (oleum tiglii), the fixed oil from the seeds (irritant resin).

Dose

Jalap:		
D.	gr x—1x	.6—4.
Sw.	ʒi—iv	4—16.
Resin of Jalap:		
D.	gr i—x	.06—.6
Sw.	gr vii—xxx	.5—2.
Colocynth Extract:		
D.	gr 1/8—1/4	.008—.016
Sw.	gr ss—ii	.03—.13
Compound Colocynth Extract:		
D.	gr i—viii	.06—.5
Sw.	gr iv—xv	.25—1.
Podophyllum:		
H.	ʒi—iiss	5—10.
D.	gr iss—iv	.1—25.
Resin of Podophyllum (called podophyllin):		
D.	gr. 1/12—i	.005—.06
Gamboge (resin):		
Cattle	℥ 1/4—i	8—30.

(This is often mixed with epsom salt and table salt in water.)

Elaterin:

D. .....gr 1/20—1/12 (.003—.005)
(This drug is very potent.)

Croton Oil:*

(10 drops kill dogs; 8 to 30 drops have killed a horse by intravenous injection.)

H.	m x—xxx	.6—2.
C.	3ss—i	2—4.
Sh. & Sw.	m v—x	.3—.6
D.	m 1/4—ii	.015—.12

*NOTE—This drug is by far the most drastic of all the purgatives. It is so violent in action that it is also used externally as a vesicant or blistering agent. For this reason when given to animals it must be given well diluted in the form of an emulsion or oil, such as linseed or olive oil.

This is the ninth of a new series of 12 articles by Professor Lewitus on Drugs Used by Veterinarians. The tenth article will appear in an early issue.—EDITOR.

Torsion of the Uterus in a Cow

January 16, 1938, I was called to see a three-year-old Holstein cow with her second calf. Her time to calve was January 15th, the day before I was called.

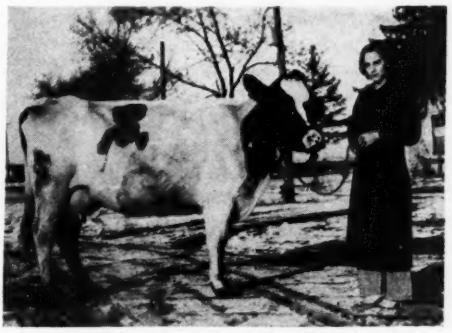
On examination, I found that the uterus had made a one-half turn on its long axis. To revert the turn and complete normal delivery was out of the question. I decided to perform a cesarean section and had the cow brought to my hospital.

One and one-half ounces of chloral hydrate were administered in a drench, and the field prepared. By the time this was completed, the chloral hydrate was showing its effects quite well. I then made an epidural injection of 20cc of a 2½% solution of novocaine. The patient rested very quietly during the operation.

The calf was fully developed and weighed 100 pounds, but was dead. The cow was placed in a large, clean, box stall and on the eighth day after the operation was sent home. At this time she was giving 40 pounds of milk a day. She made a very nice recovery.

Sixty days after the operation, I made an examination and found the uterus in a normal position; both ovaries were also normal. I was informed the cow had been in estrum a few days before. I see no reason why this cow should not become a regular breeder.

In obtaining the history of this case, I learned this cow had slipped and fallen



Cow following cesarean section necessitated by torsion of the uterus.

three days before I was called. I assume the torsion of the uterus took place at that time.

I have had several cases of incomplete torsion of the uterus, and in these effected normal deliveries, which was by no means an easy task; some of the cases died and some lived. After considering all the phases of this case and the outcome, I favor cesarean section.

BERNHARD WITT.

Scribner, Nebr.

Newer Ideas in Food Sanitation

F. W. Fabian (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, Vol. 15, No. 10), recommends that every employee in the food and dairy industry be required to take a complete medical examination by a competent physician, with laboratory examination of blood, feces, and urine when he is employed and semi-annually thereafter. As an added protection, all employees coming in direct contact with food, milk or dairy products must be examined daily by a nurse, foreman, or some other person for evidence of contagious diseases. It is also suggested that only those people who are inherently clean should be employed in the food or dairy industry. All new employees should be watched until they have been so classified.

Buffalo Gnats in the Ears of Horses

By G. E. COTTRAL, K.S.C., '38

Introduction

Buffalo gnats, or black flies, are blood-sucking pests, belonging to the family *Simuliidæ*. Members of this family recently found biting the ears of horses were identified as *Simulium vittatum*.

The adult buffalo gnat is a relatively small, dark-colored, thick-set fly. The thorax is short, thick and provided with a hump, from which it gets the common name, as the protuberance resembles the hump of a buffalo. The antennæ, legs, and wings are short.

As most of the references consulted lacked data of veterinary interest, the writer felt that an article describing the injury done by buffalo gnats, since they are not unimportant pests of horses, would be of value to veterinarians.

Occurrence of the Pest

Buffalo gnats are found from the Arctic and Antarctic regions to the Tropics. *S. vittatum*, the most important parasitic species in Kansas, has been found in most parts of the United States. This species seems to be relatively abundant in Riley County in the spring of 1938. These pests are sometimes found many miles from their place of nativity. They often travel in swarms, being most noticeable from two to five o'clock in the afternoon.

Life Cycle

There are usually two generations produced each year, the first in early spring and the second in late summer or early fall.

The female prefers a swiftly flowing stream in which to lay her eggs. She deposits the eggs close together in a single layer just beneath the surface of the water, on blades of grass or on small rocks.

In about 7 to 12 days, depending on the temperature, the eggs hatch and the larvæ come forth. The larvæ are able to hold their positions by means of a sucker, or temporarily leave when disturbed by winding or unwinding a silken thread, which they manufacture. (An erroneous superstition states that fish have been caught in these threads.) The larvæ molt several times and then spin a pupal case, thus terminating the approximately 17-day larval stage.

The pupal stage lasts about four days. During the last few hours of pupation, air from the water is accumulated in the pupal case. This accumulated air forms a bubble in which the adult flies leave the pupal case and rise to the surface of the water. Thus we have the old observation that when many buffalo gnats are coming out of a stream, the water appears to boil.

Copulation soon occurs and the males die after a short life. The females feed on their vertebrate hosts and then seek a suitable location to start the next generation.

Case Report.—On the afternoon of March 19th, 1938, a unit of the ambulatory veterinary clinic of Kansas State College called at a farm about two miles south of Zeandale, Kansas, to render veterinary service. While holding a horse, the writer accidentally discovered many small flies in the animal's ears.

Further examination, by turning back the edges of the ear, revealed that the involved area was limited to the concave portion of the auricula, and did not extend into the external acoustic meatus. This area was speckled with small drops of dried blood, resembling the affected sites of a badly flea-bitten dog. About 25 to 30 small, dark-colored flies, steadied by the sparse short hairs of the region, were observed attached perpendicular to the epithelial surface. Their red-tinged distended abdomens evidenced that they were sucking blood. When disturbed the flies readily disengaged themselves and quickly flew away. The other ear was similarly but not as severely involved.

All of the equidæ on this farm, including nine horses of various ages, three mule colts, and a jackass, showed either flies in their ears or evidence of having been bitten. No body areas on the animals other than the ears were involved, and on none of the 26 cattle on the farm could bitten sites be located.

Two days later an inspection of the animals on two adjoining farms revealed that of nine horses, all but two showed either evidence of having been bitten, or the presence of the flies. These two clean animals had been kept in the barn for the past two weeks.

A number of the flies were captured and later identified as *Simulium vittatum* by Dr. Roger C. Smith of the Entomology Department of Kansas State College.

A bottle of a camphor-phenol mixture was dispensed to paint on the ears of the animals, as a

fly-repellent and antiseptic. Apparently frequent applications of the mixture were beneficial, since the pests continued to bite neighboring animals but not those treated.

Pathogenicity

The first recording found by the writer of buffalo gnats in the ears of horses, was made in 1874 by J. P. Megnim.[1] He stated that the bites of the gnats caused a "psoriasis guttata" in the ears of horses, and that at that time the condition was quite prevalent around Rhone, France. He also advanced the theory that several species of Simulium are vectors of virulent charbon in cattle.

The following men also mentioned finding buffalo gnats in the ears of horses: Lugger, 1896[2]; Mallock, 1910[3]; Jobbins-Pomeroy, 1916[4]; Smith, 1932[5].

In 1905 Dr. Louis Sambon[6] advanced the theory that pellagra might be caused by Simulium. This erroneous theory started a great deal of research on buffalo gnats. (Emery[7], 1913.)

Mönnig[8] summed up the animal diseases transmitted by buffalo gnats as follows: "Certain species of Simulium transmit *Onchocerca* (filarial worm) and *S. venustum* transmits *Leucocytozoön anatis,* a blood parasite of ducks, while *L. smithi* of turkeys and *L. caulleryi* of fowls are also transmitted by these insects." Perhaps infectious equine encephalomyelitis or other horse diseases may some day be proved transmitted by buffalo gnats.

The adult females of the species *S. vittatum* will bite men, horses, mules, asses, cattle, hogs, and dogs, but not poultry. The biting apparatus of the gnats penetrates the small capillaries of the part and blood is withdrawn, leaving a tiny opening through which several drops of blood ooze out to coagulate on the surface. An irritant substance, possibly an anticoagulant, is injected during the bite.

The unsubstantiated claim has been made that animals have died of asphyxiation and foreign body pneumonia after inhaling great numbers of these pests attacking in a swarm. The poison injected into an animal by a swarm of these insects may cause a local inflammation of the skin, psoriasis guttata, or the so-called buffalo gnat poisoning, or even death.

Smith, 1932[5], reported finding *S. vittatum* at Westmoreland, Kansas, causing injury to mules, horses, cattle and hogs. Some of the animals, besides showing bitten areas, displayed stupidity, anorexia, emaciation and swelling of the regional lymph glands. One of the mules died as a result of the condition.

About one-third of the horses and mules brought to the veterinary clinic of Kansas State College this spring showed bitten ears. For the most part one can point to buffalo gnats as the probable cause of this condition. *S. vittatum* when present in small numbers seems to prefer biting the ears of equidæ.

Treatment

The usual recommended treatment is the use of fly-repellents and protectives, since rendering the breeding places unsuitable is usually impractical.

Fly sprays, axle grease, various oils, mud, molasses, camphor-phenol mixtures, and other similar preparations have been applied locally with varying results. No treatment for the more severely involved animals has been described.

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Canine Pediatrics

III. Analytical and Biological Study of Milks in Application to Puppy Feeding

By D. M. CAMPBELL, Chicago, Illinois

In a previous installment of this series some statistics were given showing the great economic importance of the dog industry. Some have thought that the sporting branch of the industry was not sufficiently recognized in this discussion.

In a paper presented at a recent veterinary meeting, Dr. C. E. Crowe, veterinary editor of *American Field*, gave the following statistics pertaining to sporting dogs:

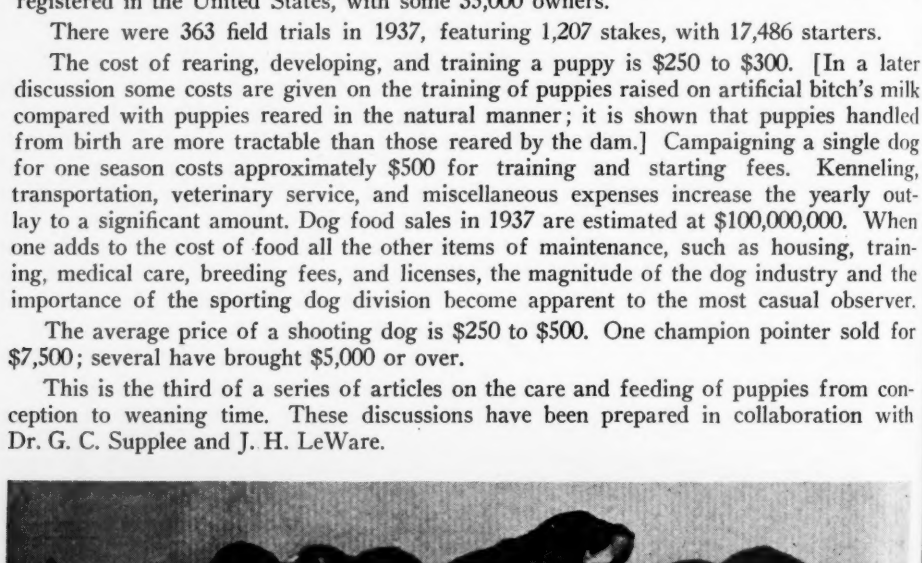
There are 275,000 dogs registered in the field dog stud book, with file records of 2,000,000 pedigreed dogs. The number of pure-bred bird dogs, principally setters and pointers, registered each year approximate 14,000. About 9,500 owners register sporting dogs yearly. All told, there are something like 80,000 living pure-bred sporting dogs registered in the United States, with some 35,000 owners.

There were 363 field trials in 1937, featuring 1,207 stakes, with 17,486 starters.

The cost of rearing, developing, and training a puppy is $250 to $300. [In a later discussion some costs are given on the training of puppies raised on artificial bitch's milk compared with puppies reared in the natural manner; it is shown that puppies handled from birth are more tractable than those reared by the dam.] Campaigning a single dog for one season costs approximately $500 for training and starting fees. Kenneling, transportation, veterinary service, and miscellaneous expenses increase the yearly outlay to a significant amount. Dog food sales in 1937 are estimated at $100,000,000. When one adds to the cost of food all the other items of maintenance, such as housing, training, medical care, breeding fees, and licenses, the magnitude of the dog industry and the importance of the sporting dog division become apparent to the most casual observer.

The average price of a shooting dog is $250 to $500. One champion pointer sold for $7,500; several have brought $5,000 or over.

This is the third of a series of articles on the care and feeding of puppies from conception to weaning time. These discussions have been prepared in collaboration with Dr. G. C. Supplee and J. H. LeWare.



HEALTHY-LOOKING BUT DOOMED TO DEATH

These hound puppies, photographed at five days of age, appear to be in excellent condition with every chance of thriving on their artificial food. Their pseudo-thrifty appearance, however, does not show their physiological struggle to establish immunity to incompatible characteristics of a faulty formula. Their hypersensitivity reached a zenith two days after this photograph was taken, they rapidly declined, and all were dead within 18 days.

THE key to successful artificial feeding of puppies is a study of the unique characteristics of bitch's milk. Some of these characteristics can be measured; other attributes are less tangible but none the less significant.

Since cow's milk is universally familiar and is the milk upon which a vast body of research data has been built, it obviously is a convenient lacteal standard with which to compare all other milks. This superficial comparison is useful and valid within the limitations of the available analytical procedures, which reveal only comparative gross values. The more transcendent properties of the various milks must be dealt with differently.

Arbitrary selection of cow's milk as the gross analytical norm incidentally serves the valuable purpose of emphasizing that since other milks vary from the cow's product the latter therefore does not necessarily represent the optimum of suitability for the nourishment of the young of all species, as its ready availability and indiscriminate use might suggest.

These circumstances are superbly illustrated in the nutrition of very young puppies, both as an abstract example and as a vital consideration in the practice of canine pediatrics.

BROADLY speaking, milks contain fats, carbohydrates, proteins, minerals and the accessory vitamin factors in proportions that vary with—and, to a much less extent, within—the species that produce the milks.

Table I shows the comparative compositions of cow's milk and bitch's milk, on a fluid basis, with reference to these primary nutritive elements.

TABLE I

	Cow's Milk	Bitch's Milk
Fat	3.54	9.00
Carbohydrates	4.65	3.10
Proteins	3.20	8.00
(Casein)	(2.70)	(3.50)
(Albumin)	(.50)	(4.50)
Minerals	.70	.90
Total Solids	12.09%	21.00%

It is seen readily that bitch's milk has about twice the total solids content of cow's milk; the fat content of bitch's milk is 2½ times as great, the carbohydrate (lactose) content 33% less, the protein content 2½ times as great, and the mineral content 29% higher.

This comparison may come as something of a shock to those who have followed the common practice of feeding puppies a 2/3 cow's milk, 1/3 lime water dilution. It is apparent that such procedure only accentuates the nutritive imbalance inherent in cow's milk as a food for new-born pups by further diluting the solids supplied by this source. The relative proportions of the individual components are not changed by this procedure.

STRIKING evidence of the necessity of providing artificially fed puppies with a formula that maintains the physical and chemical balances of natural bitch's milk in order to avoid any dysfunctioning of the delicate gastrointestinal tract and the normal processes of metabolism, is offered in a comparative study of carbohydrate contents.

The only carbohydrate found in the milk of any species is lactose. The differences in lactose content of the milks of the various species are entirely quantitative from the analytical view, yet these differences have much greater biological significance when considered in the light of variation in ratios among constituents.

Thus, while bitch's milk contains only 33% less carbohydrate than cow's milk, the real significance lies in the fact that the ratio of protein content to lactose content in bitch's milk is 1 to 0.39, as contrasted with the ratio of 1 to 1.45 for cow's milk. The differences in protein-fat ratio in the two milks are less striking, as seen in Table II.

TABLE II

RATIO	Cow's Milk	Bitch's Milk	Simulated Bitch's Milk*
Protein to Carbohydrate	1:1.45	1:0.39	1:0.38
Fat to Carbohydrate	1:1.31	1:0.34	1:0.35
Protein to Fat	1:1.11	1:1.13	1:1.07

Understanding the full significance of the differences in ratios of the relative compo-

* Borden Research Laboratory formula.

sitions of different milks should once and for all dispel any illusions about the efficacy of diluting cow's milk for the feeding of very young puppies. It is obvious that while a proper dilution could reduce the gross difference of 33% in lactose content, no juggling of dilutions could ever cope with the differences in carbohydrate-fat-protein ratios.

These ratios have more than mere statistical significance to puppies. In clinical feeding the lactose ratios proved to be one of the key considerations for compounding a satisfactory simulated bitch's milk. Feeding tests proved that there is a definite intolerance in puppies to any disproportionate amounts of lactose. The tendency of natural cow's milk to cause diarrhea and excessive dehydration, can be brought within control in the feeding management of very young pups more readily with proper lactose-protein ratios than is otherwise possible. It is not to be assumed, however, that this unfavorable condition in young pups is specific for lactose only. Certain other carbohydrates have a similar effect, but possibly not to as marked a degree.

ANY milk—whether it be from a human, a cow, or a bitch—is a colloidal system made up of a solution of lactose, certain soluble minerals, and proteins in various degrees of dispersion varying from the gross agglomerates as typified by the casein, to the highly dispersed lactalbumins, globulins, and little known mucoid proteins, in which fat and certain minerals are held in an equilibrated suspension.

The differences in degree of dispersion vary with the milk of the different species to correspond with the specific capacities and peculiarities of digestion and assimilation of the young of the particular species.

Pervading this mixture, various vitamins and accessory factors with enzymatic and catalytic properties are physically or chemically bound with the different components in a diffuse manner, which condition of association definitely determines many of the nutritive properties and physical reactions of milk not determinable by analytical means.

Such an association of entities constitutes the ensemble of milk as a whole and it is this prosthetic relationship existing between various entities, and especially the complex colloidal system of the milk proteins, which establishes the unique character of a milk as a nutritive substance.

The basic phenomena of, and an approach to an understanding of the significance of, prosthetic union between active substances (for example, that of vitamins, certain hormones and other trace substances with complex components of a high molecular weight as typified by the proteins), is an aspect of biophysics which calls for the application of the very recent concepts of the science of surface chemistry. Such considerations undoubtedly will prove to be of epochal importance in guiding future physiological and medical investigations, and the applications of such concepts have been of major importance in the developments leading to simulated bitch's milk; hence the justification for brief reference to this important subject in this discussion.

ASIDE from the broad physical differences in milks, consideration must necessarily be given to the more subtle variations in composition of the individual nutritive entities that further define the specificity of the milk of a given species. The specificity of a milk is predicated upon, and is the complement of, the specificity of the nutritive needs and utilization capacities of the young of the particular species.

As a practical example, in formulating a compound for the artificial feeding of very young puppies it is essential that fundamental knowledge of the character and significance of dispersions in bitch's milk be applied in order that the capacities of the puppy to digest, tolerate, and assimilate the various factors be complemented in a balanced whole. Cow's milk, plain or diluted, fails to meet this prerequisite.

Fat, as another example, is a general term that classifies a group of compounds which have the common characteristic of oiliness. All fats are not universally or equally assimilable. Cow's milk contains fat of a character that cannot be fed in excessive or disproportionate amounts to the

canine species without causing digestive disturbances. The fact that the young puppy's system cannot tolerate excessive milk fats makes it necessary to provide any successful simulated bitch's milk with a suitably balanced fat component that will meet the pup's caloric fat requirements and at the same time will not injure him.

The inherent specific capacities of various species to tolerate and assimilate certain components, especially proteins, of the milk of other species are not susceptible of measurement by the usual analytical means as developed to date. The nearest approach to the comparative measurement of these intangible but vital differences undoubtely lies within the fields of serological and immunological science, and even such an approach is limited to indirect comparison and interpretation.

The academic significance of this circumstance, as well as its basic importance in the task of synthesizing a true simulated bitch's milk, is revealed in the case histories of puppies who died directly as a result of improper protein feeding and of others who flourished on tolerable protein rations.

IT is a biological axiom that the protein of one species is toxic to another, except as the individual acquires and enlarges an ability to tolerate and utilize specific foreign proteins.

The incompatible nature of proteins may be analogous to the toxicity of substances produced in a diseased system by the presence of bacteria, and the processes whereby the individual may acquire tolerance to a protein, in other words, a degree of immunity to its incompatible characteristics, analogous to the processes wherein the individual acquires resistance to a disease through vaccination.

Toleration depends upon an ability to combat successfully incompatibility, and immunity to a specific toxicity or incompatibility is the ultimate degree of toleration.

These incompatible proteins, or antigenic substances, as well as their respective neutralizing factors, the antibodies, are no doubt definite chemical entities, especially globulins, and other protein components. The albumins of milk in their natural state always have associated with them certain specific lipids; it is these lipids, either prosthetically bound or physically related to the proteins, with which the active factors or conditions contributing to incompatability probably are associated. Such factors might be said to assume the rôle of antigens when one milk is consumed by the young of another species. How well the young of a species will be able to tolerate and assimilate the milk of another species depends upon whether the factors of incompatibility of that milk lie within the inherent capacity of the individual of the species to offset effectively the toxic elements in a manner analogous to the elaboration of antibodies.

The puppy is not endowed with an innate and preëxistent abundant quota of antibody material for the successful tolerance of the incompatible elements inherent in cow's milk. However, puppies, as well as the young of other species, have a latent potential capacity for the elaboration of such neutralizing substances if an appropriate dietary, fed under appropriate conditions, is employed.

A plan which recognizes the potential limits and capacities of the pup and at the same time provides a food most nearly approaching the compatibility of bitch's milk enables the puppy to build up its own immunities against the incompatible characteristics of the foreign proteins.

A partial explanation of the intolerance of puppies for cow's milk may lie in the fact that the blood of the dog and that of the cow are not in the same blood type groups—the dog's is in the so-called guinea pig type and the cow's in the rabbit group.

Failure to take into account this specificity and incompatibility of proteins could lead easily to grave error in formulating an artificial bitch's milk if the gross analytical comparisons alone were considered. Although the casein content of bitch's milk is higher than that of cow's milk, and bitch's milk contains nine times as much albumin as cow's milk, it would be improper to assume that a product suitable for very young puppies could be obtained merely by the enhancement of cow's milk with more lactalbumin from the same milk.

WHAT actually happens to young puppies in testing the adaptability of an artificial food demonstrates the principles involved in food incompatibilities and acquisition of tolerances. There are three possible reasons:

1. The young puppy is unable to adapt its immunizing mechanism to the incompatible characteristics of the artificial food and dies sooner or later, depending upon the degree of tolerance or immunization which may have been attained before secondary dysfunction develops to handicap the pup further in the struggle for survival.

2. After a short period of virtual inanition characterized by failure to grow or loss of weight, the puppy may succeed in mobilizing adequate resistance to the antigenic properties of the incompatible food and fully establish an adequate immunity. Once this immunity is established the puppy will thrive and resume growth at an astounding rate. In other words if the puppy survives the critical and often violent period of transition to an incompatible artificial milk, he establishes a complete tolerance for the new diet.

3. The optimum response to an artificial diet is that manifested by young pups which receive a formula of maximum compatibility, namely one with the least antigenic characteristics, with the feeding regimen so managed that the immunizing process proceeds gradually without undue strain on the young animal's vitality and inherent limitations of adaptability. Such a formula for the young pup and its proper management should permit a controlled rate of growth during the period when tolerance is being established. Once complete tolerance for the artificial milk has been attained upon completion of the immunizing process, it usually will be found that, within reasonable limits, an animal so immunized will respond to greater amounts of food, can tolerate greater latitude in the feeding schedule and regimen, and will grow and thrive in a remarkably satisfactory manner.

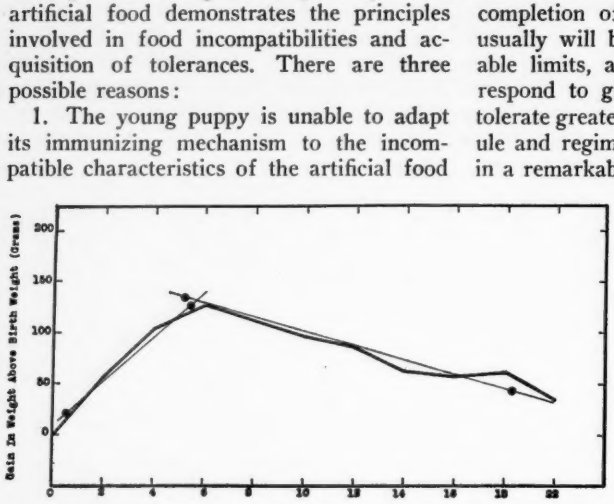


CHART III

The puppy whose brief life history is recorded in this graph died at 22 days of age because the animal's system was unable to develop adequate immunity to antigenic characteristics of an incompatible artificial feeding formula. The growth increment up to the sixth day appears to compare favorably with optimum development on bitch's milk, but this progress terminated abruptly when the crisis of hypersensitivity was reached.

EACH of these types of response by puppies to bottle or artificial feeding is well exemplified in the typical cases recorded in the accompanying photograph and charts.

Chart III graphically represents the characteristic reaction of a young pup incapable of establishing complete tolerance to a particular incompatible artificial formula. This puppy was on the same formula for the entire 20-day period. Up to the sixth day the sole unfavorable indication was the fecal condition characteristic of food intolerance which first was manifested on the second day.

Despite the fact that the puppy was carrying on a struggle to establish complete immunity to the incompatible features of the artificial diet, during the first six days external physical conditions were excellent and the growth rate was satisfactory—equal to that of a puppy receiving good bitch's milk. (Comparison of the statistical slope of the first increment in Chart III with the corresponding slope in Chart IV, which records the growth rate of a puppy on a satisfactory diet of bitch's milk, shows that the two straight lines are practically parallel and that the growth rates therefore are equal.)

The graph shows that at the sixth day the zenith of hypersensitivity and the crisis had been reached. At this point the puppy suffered physiological collapse, followed by gradual loss of weight, emaciation, and other symptoms, the significance of which will be discussed in detail later in this series of articles.

The decline continued until death at the 20th day when the animal succumbed to food intolerance, or more specifically to the inability to establish complete immunity to the antigenic characteristics of the particular formula.

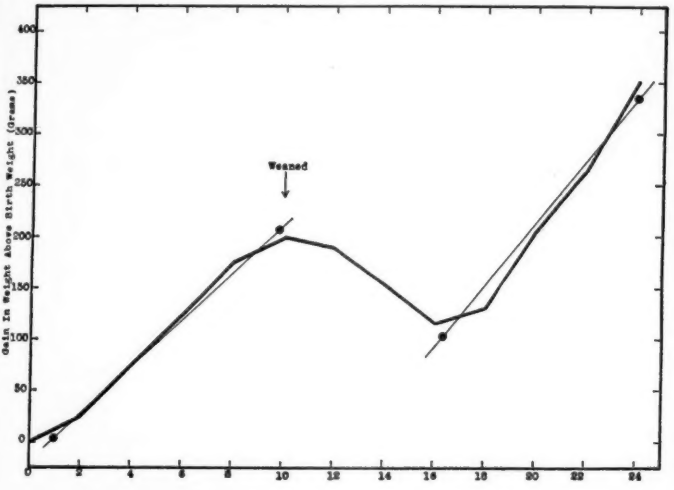


CHART IV

Although the puppy whose case history is represented in this chart lost weight for the first six days after weaning from bitch's milk to artificial formula, the animal's system succeeded in developing complete tolerance to incompatible characteristics of the food and thereafter displayed remarkable growth response.

The photograph presented herewith shows a litter of puppies five days old which had received an incompatible artificial formula. To all external appearances these pups were in a thrifty condition, and to the casual observer gave promise of satisfactory maturity on the artificial diet. However, within two days after the photograph was taken the zenith of hypersensitivity to the incompatible components of the diet had been reached, and each of the seven pups began to lose weight, diarrhea became acute, and the process of dehydration started. The puppies were all dead within 18 days, each reacting in substantially the same manner as exemplified in Chart III. The appearance of thrift and vitality of the puppies at 5 days of age was deceiving in that the preceding gain in weight, tissue turgor and general appearance of well being was due to excessive hydration rather than to the accumulation of normal tissue. Excessive hydration during the period of sensitization to the incompatible element of the artificial diet is a common characteristic of this reaction.

THE second type of response encountered is shown in Chart IV. During the first ten-day period of record the animal thrived on bitch's milk. At ten days of age the puppy was weaned abruptly to a particular artificial milk preparation. There was an immediate decline in weight which proceeded at a substantially constant rate for six days. During this six-day period the processes of immunization against the incompatible characteristics of the formula were progressing within the animal. Aside from loss of weight the apparent physical condition of the puppy was satisfactory, with, however, slight changes noted in the condition of the feces. After six days the animal began to gain rapidly as shown by the steepness of the second statistical slope. Comparison with the earlier slope shows that the new weight gain rate was greater than that during the period when the pup was on bitch's milk. The six-day period of adaptation had established a complete immunity to the incompatible element of the artificial diet.

Chart V records the response of a

young puppy which received well-managed feedings of a highly satisfactory simulated bitch's milk throughout the 20-day observation period of record. During the first 12 days this formula was administered according to definite standards of measurement and on a schedule which would not overtax the physiological capacities of the animal during the period the body was establishing a tolerance for this less antigenic formula. The graph shows that the growth rate was constant and substantially uniform from day to day. However, a comparison of the statistical graph of the first increment with the statistical slopes of the first increments of Charts III and IV shows that the growth rate during this period of adaptation was slower than in the two former cases. But the significant object lesson in Chart V, lies in the fact that at the 12th day, a substantially higher intake level of the same satisfactory simulated bitch's milk per unit of body weight brought immediate, heightened growth response.

The growth rate from day to day was remarkably uniform and equal to or greater than that obtained on bitch's milk shown in the first increment in Chart IV, or that of the second increment of Chart IV which already has been explained as typifying a different type of reaction of the animal during the immunization process.

The results recorded in Chart V, therefore, illustrate the fact that tolerance for artificial milk fed to this puppy was established while a uniform, constant, but temporarily slower growth rate was maintained, and that complete establishment of this tolerance permitted substantial increase in food intake with commensurately accelerated growth response and thrift of the animal after full immunity was attained.

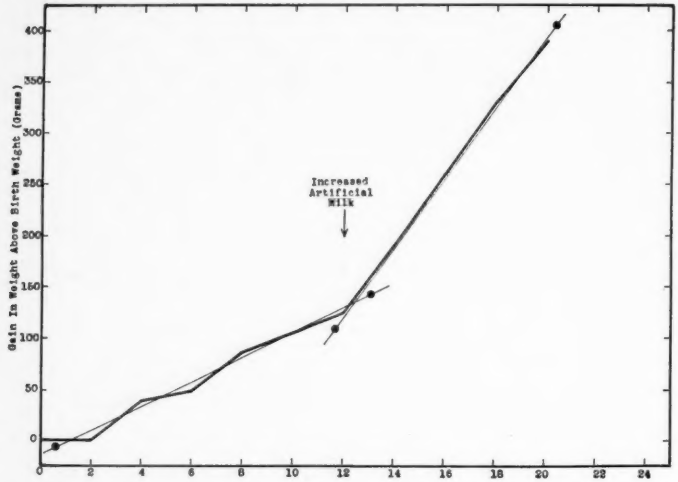


CHART V

The consistent and uniform growth increments shown in this chart characterize the pattern of response of a very young puppy to well-managed bottle feedings of simulated bitch's milk formulated to reduce antigenic characteristics and to promote tolerance without taxing the pup's capacities. After the initial 12-day period of controlled growth rate during which immunity was developing, a substantially increased food intake brought an accelerated growth response.

THE foregoing explanation and detailed treatment of case histories clearly emphasize phenomena which in substance may be considered typical patterns of reaction of very young puppies to satisfactory as well as unsatisfactory simulations of bitch's milk. Comparison of results shown in Charts IV and V illustrates graphically the vital significance of the feeding regimen in raising artificially fed puppies.

Any broad consideration of milks requires comparisons of relative vitamin and mineral contents in addition to studies of fat, carbohydrate, and protein constituents. Minerals and vitamins afford further examples of significant disproportion between gross analytical contents of different species and biological requirements.

All these aspects which, with their related subjects, form an intimate practical nutritional basis for the practitioner of canine pediatrics, will be presented in succeeding articles with additional typical case histories of experimental animals.

Udall to Address British Veterinary Congress

The 1938 congress of the National Veterinary Medical Association of Great Britain and Ireland will be held at Glasgow, Scotland, September 5-9. The General Secretary, Mr. F. Knight, M. R. C. V. S., invites any American veterinarians and their families who may be in Europe at that time because of attendance at the 13th International Veterinary Congress in Switzerland, or for other reasons, to attend the British congress.

Dr. D. H. Udall of Ithaca, New York, will present a paper on mastitis at this congress.

The program for the congress, except for the large number of those listed to dicuss the papers, is as follows:

SUNDAY, SEPTEMBER 4TH.

"At Home," as guests of the Scottish Divisions (Central Hotel).

MONDAY, SEPTEMBER 5TH.

Morning.—Civic Welcome.

Opening of Exhibition of Drugs and Instruments.

Paper: "Virus Diseases, with Special Reference to Immunity" (Concert Hall, Empire Exhibition, Bellahouston Park).

Afternoon.—Motor Tour: "Three Lochs" (Loch Lomond, Loch Long, and Gareloch).

Evening.—Civic Reception (City Chambers, George Square, Glasgow).

TUESDAY, SEPTEMBER 6TH.

Morning.—Paper: "The Problems of the Practitioner with regard to the Diagnosis and Treatment of Diseases of Young Pigs" (Concert Hall, Exhibition).

Afternoon.—Demonstrations.

Council Meeting (Glasgow Veterinary College).

Evening.—President's Reception (Central Hotel).

WEDNESDAY, SEPTEMBER 7TH.

Morning.—Paper: "Mastitis."

Annual Meeting.

Congress Photograph (Exhibition).

Afternoon.—Golf Competitions (Cathkin Braes Golf Club).

Evening.—Annual Banquet (Central Hotel).

THURSDAY, SEPTEMBER 8TH.

All-day excursion by steamer—Clyde, Firth, Kyles of Bute.

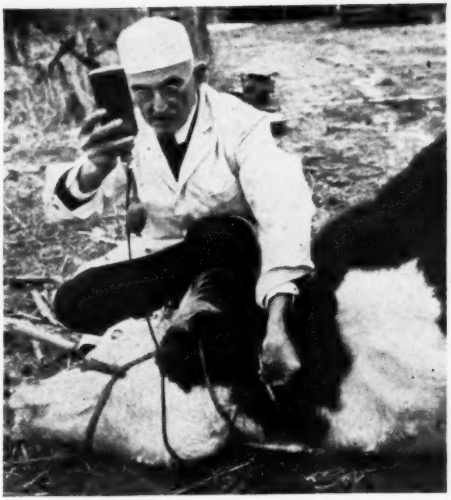
Evening.—Veterinary Benevolent Dance (Ca'dora Restaurant).

FRIDAY, SEPTEMBER 9TH.

Morning.—Three Short Papers.

Afternoon.—Closing Meeting (Exhibition).

Council Meeting.



Intravenous Injection of Sodium Iodide

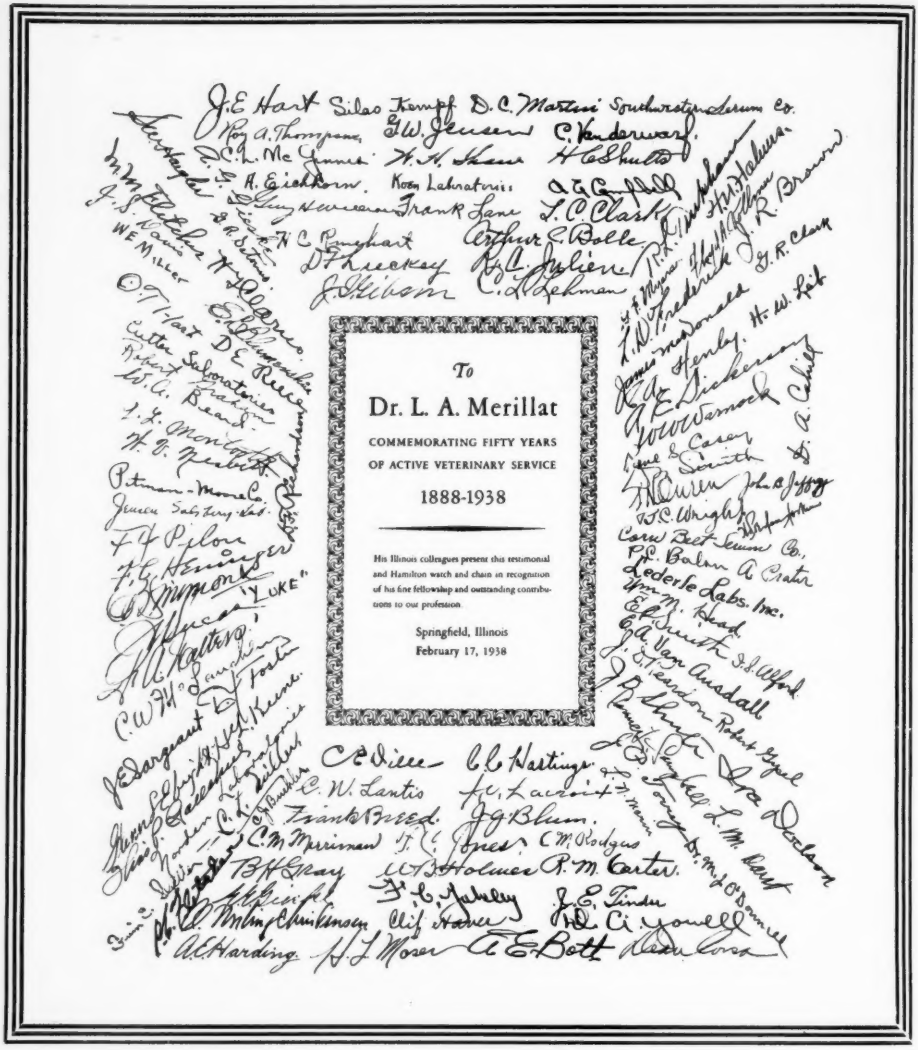
The illustration shows Dr. T. A. Sigler, Greencastle, Indiana, treating a steer for actinomycosis. One ounce of sodium iodide in 500cc of distilled water constitutes a dose. Only serious cases require more.

Gnat (Black Fly) Repellents

Removing livestock from river bottoms and the timely use of repellents are the only hope for relief from the gnat plague. Dense smudges from burning wood, paper, or rags help repel an attack. The following repellents have been found effective: Mix one ounce of castor oil, two ounces of pennyroyal and three ounces of refined pine tar oil. Paint the exposed parts of the body with this mixture.

The Department of Agriculture recommends this emulsion: One pound of fish oil soap, three quarts of fresh cylinder oil, one gallon of water, and one gallon of kerosene extract of pyrethrum. The water and soap are heated to near boiling and then stirred vigorously while the mixture of kerosene extract and cylinder oil is slowly poured in.

Certain species of these gnats are capable of transmitting disease to their victims by injecting with their bites immature stages of protozoal parasites. Thus, *Simulium venustum* is known to transmit *Leucocytozoön anatis* to ducklings, while *Simulium occidentale* may transmit *Leucocytozoön smithi* to turkey poults.


To
Dr. L. A. Merillat
COMMEMORATING FIFTY YEARS
OF ACTIVE VETERINARY SERVICE
1888-1938
His Illinois colleagues present this testimonial and Hamilton watch and chain in recognition of his fine fellowship and outstanding contributions to our profession.
Springfield, Illinois
February 17, 1938

FIFTY YEARS OF VETERINARY SERVICE

The above is a reproduction (much reduced) of a certificate presented to Dr. L. A. Merillat of Chicago to commemorate the completion of 50 years of veterinary service in Illinois. The presentation of the certificate and a fine gold watch was made at the annual meeting of the Illinois Veterinary Medical Association at Springfield, on February 17th. At the sixth annual clinic of the Mississippi Valley Veterinary Association, Doctor Merillat was presented with a beautiful, engraved fountain pen and pencil set to commemorate his half century of veterinary service. The Eastern Iowa Veterinary Association and the East Central Veterinary Association held a special banquet for Doctor and Mrs. Merillat on May 12th at Cedar Rapids, also to celebrate the completion of his half century in the profession. On this occasion he was presented with a gold, engraved cigarette case. It will be remembered that the Ontario Veterinary College also celebrated the fiftieth anniversary of the graduation of Doctor Merillat from that school (*Vet. Med.* April, 1938, pp. 152-55).

In his response to the presentation address at the Cedar Rapids banquet, Doctor Merillat stated that he accepted the present and the panegyrics not as a personal tribute, but as a recognition of the importance of veterinary medicine to human welfare.